The Electrical Industry's Weekly Magazine November 30, 1959

Electrical World

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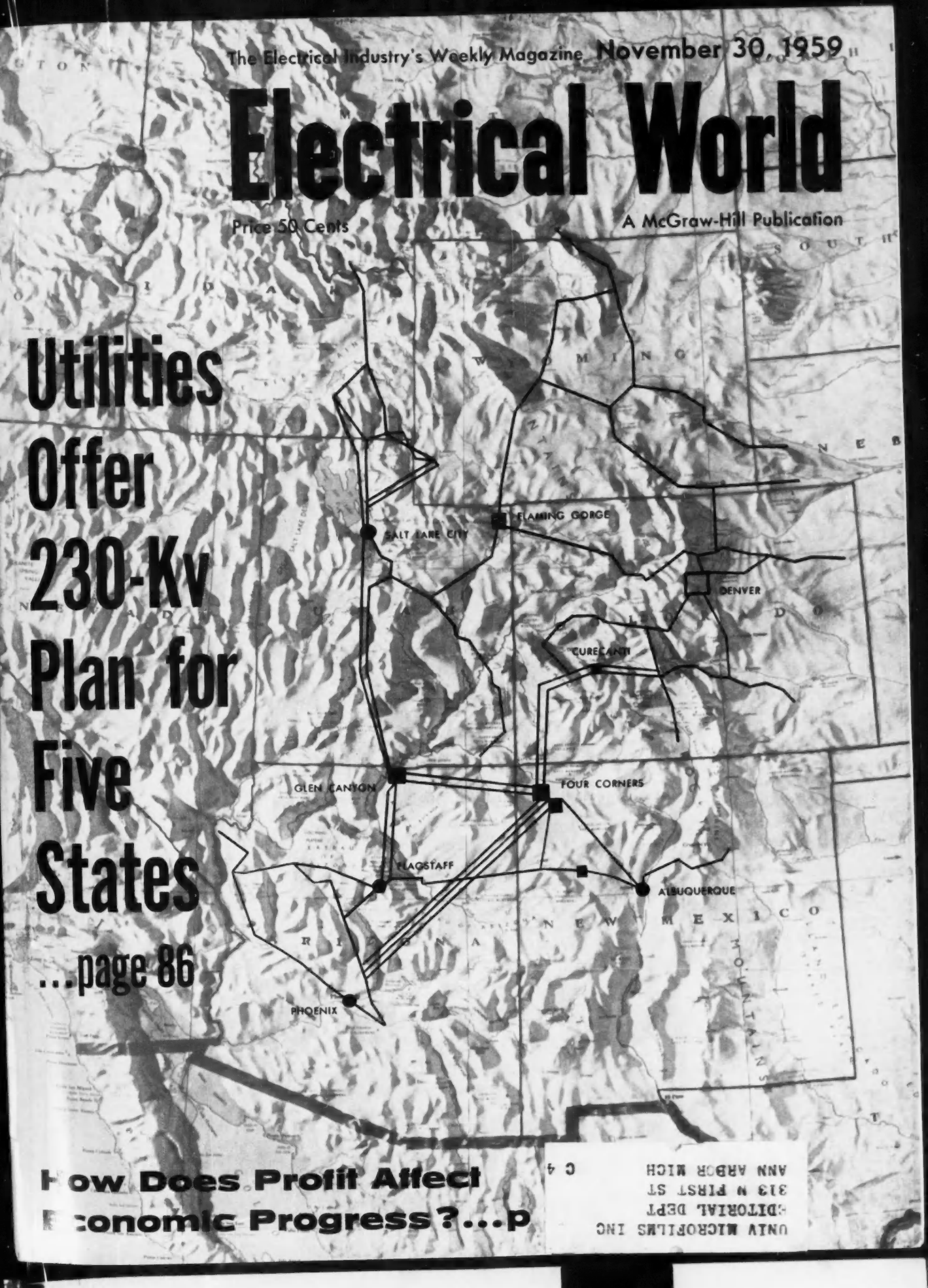

Utilities Offer 230-Kv Plan for Five States

...page 86

How Does Profit Affect Economic Progress?...p

UNIV MICROFILMS INC
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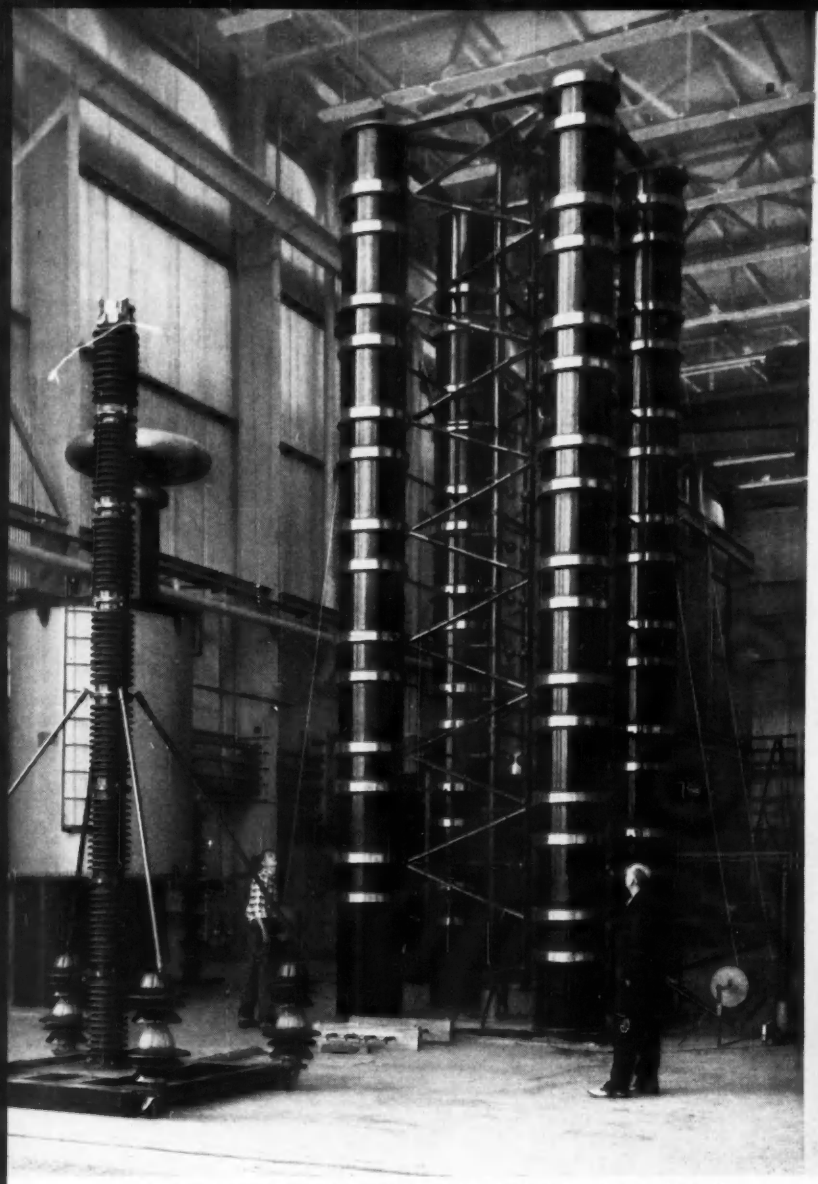

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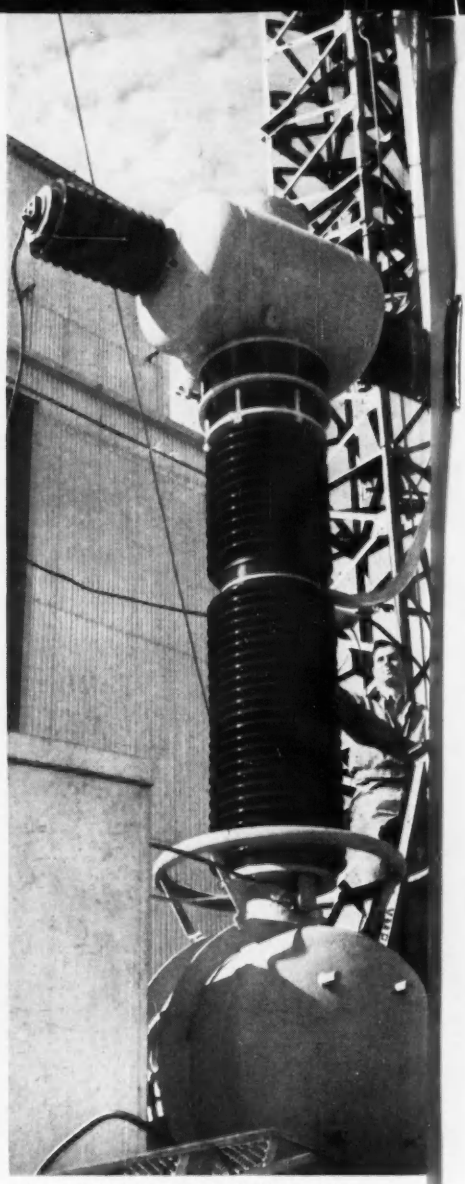

THIS AIR-BLAST TRANSMISSION BREAKER is being prepared for a power/impulse test.

AT GENERAL ELECTRIC'S NEW HIGH VOLTAGE TESTING LABORATORY IN PHILADELPHIA . . .

Nature Comes Indoors

Effects of lightning and rain on power systems being studied in new research facility

The latest addition to General Electric's Switchgear Development Center in Philadelphia is a million-dollar high voltage testing laboratory.

Heart of the new test center is a three million-volt impulse generator which can be set off by a synchronous timer at the exact moment a high voltage power circuit breaker is operating to clear a short circuit. Now, for the first time, General Electric engineers will be able to duplicate the situation in which lightning strikes a transmission system at the instant circuit breakers are opening. It's important that the circuit breakers of the future be designed to withstand such multi-shock conditions. The reason for this is seen in the higher, longer, and more exposed transmission lines required to carry tomorrow's ultra-high voltages.

A WET-TEST DEVICE, which simulates the effects of rain and moisture on switchgear components, is another feature of the new facility. Impulse testing will provide important information about the results of flashover on insulators and insulating materials.

Power transmission systems of the future will be even more reliable as a result of this new investment in high voltage testing facilities. For more information, contact your local G-E Apparatus Sales Office. 301-412

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GENERAL ELECTRIC

Electrical World

Vol. 152, No. 22 NOVEMBER 30, 1959

Published for 85 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

In This Week's Issue

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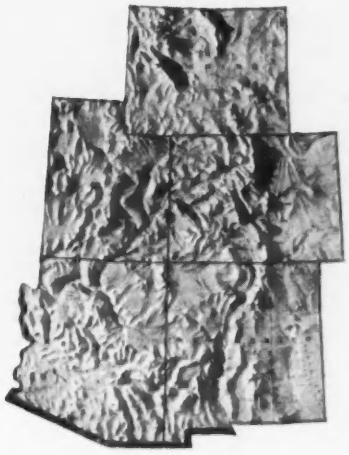

Cover map from Aero Service Corp

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Projected new loads and generation guide Rocky Mountain utilities in offering proposal to Reclamation Bureau...p 86

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LETTERS

Plaudits on Heating Conference

Following are excerpts from a few of the letters received in connection with Electrical World's Fourth Comfort Heating and Heat Pump Conference held in St. Louis last month:

To the Editor:

I have had nothing but good reports from all of those who attended the Heat Pump Conference. I regard this activity of Electrical World as a very substantial contribution to our industry. I hope you will tell your associates what a good job I think they did.

J. W. McAfee, president
Union Electric Co
315 N. 12th Blvd.
St. Louis 1, Mo.

To the Editor:

I do think the Fourth Electric Comfort Heating and Heat Pump Conference did some real good, and if my part of it helped a little, I can assure you that I was glad to make the contribution.

Harold Turner, executive vice president
American Electric Power Service Corp
30 Church St.
New York 8, N. Y.

To the Editor:

It was a pleasure to attend the first day of the Electrical World Fourth Electric Comfort Heating and Heat Pump Conference. I enjoyed it thoroughly and congratulate you on the fine program for that day . . .

I was particularly pleased to see such fine attendance and the large number of people at the executive or management level in attendance.

E. A. Wilson, vice president
Alabama Power Co
Birmingham 2, Ala.

Proceedings of the conference along with reprints of the report and survey are available at $10 *per set. They may be obtained by writing Thomas R. Jordon, Electrical World,* 330 *W.* 42*nd St., New York* 36, *N. Y.*

Dreamers Club Still Open

To the Reader:

It may be the increasing pressures of business, or the mounting budget activity, but applications for membership in the Electrical Dreamers Club have dropped considerably.

Remember, all that is required for membership is one interesting idea on the application or production of electric power.

The Editor

this man is changing taps *faster . . . safer . . . more economically!*

Take a good look at this lineman. He's changing taps alright, but his hand's *not* inside the tank, exposing the oil to contamination. And if you look closely, you'll note the absence of a hand-hole cover, thus decreasing the danger of tank breathing.

Take a good look. Note how low on the pole he is, well out of danger, and the taps will be changed in no time at all. All he has to do is remove and reverse the cap, then use it as a handle to make the setting. This saves time, which saves his employer money.

Finally, since his hand's not down inside the tank, this lineman can see what he's doing, so there'll never be any question in his mind about the tap setting!

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Ask your R T & E representative to demonstrate this Tap Changer. Or write for further specifications.

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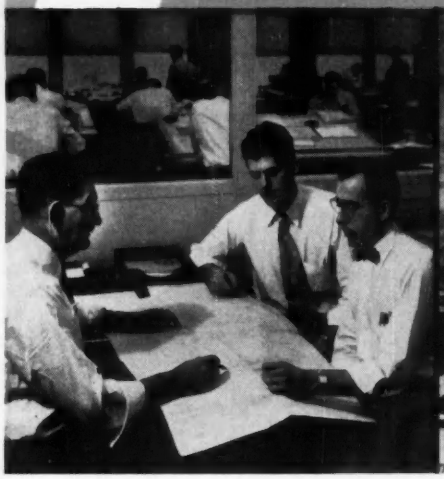
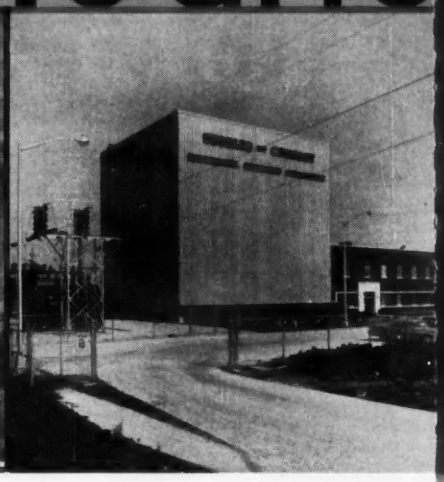


Engineering staff-specialists in switchgear

Large modern manufacturing facilities



Research development and testing facilities

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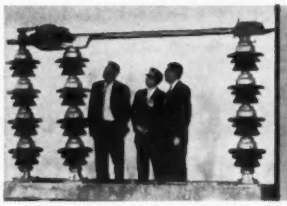
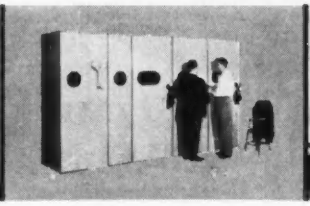
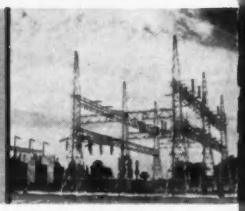


High Voltage outdoor switches



Metal enclosed switches



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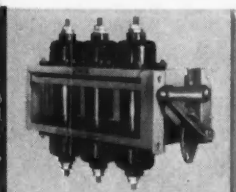
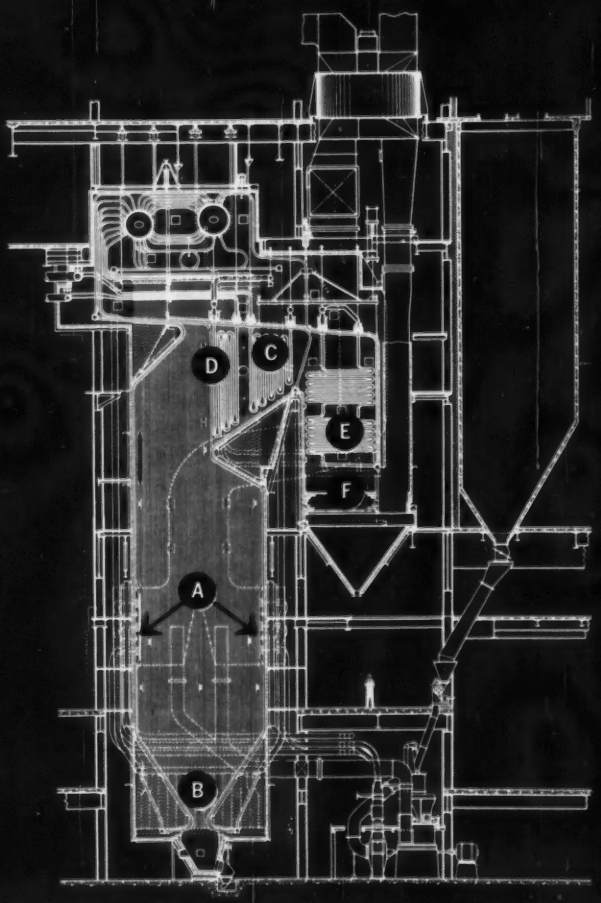


Famous ISOLATOR switches

3E

A 10-year progress report on...

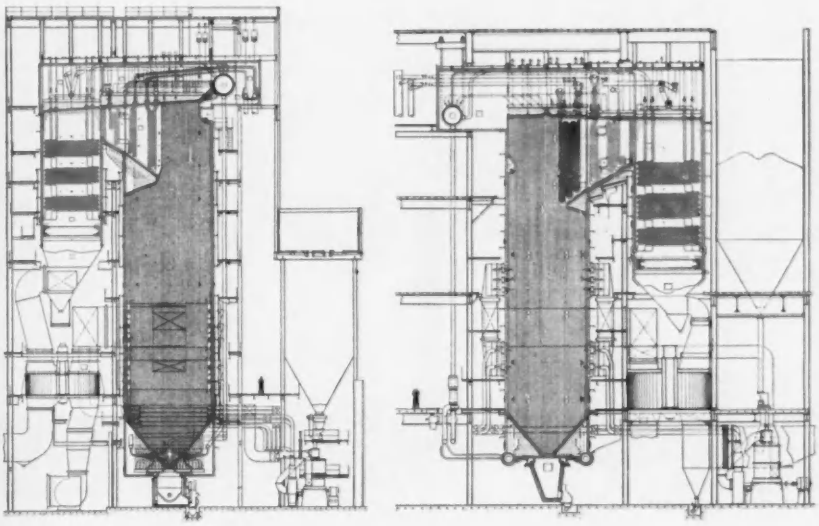
What Reheat has contributed



This unit, placed in service at the Edgar Station of the Boston Edison Company in 1949, represented the original C-E design concept of a properly arranged reheat boiler. Its chief characteristics were: tangential firing (A) with tilting burner nozzles to control reheat and superheat temperatures; a dry bottom furnace (B); reheater surface (C) between the finishing superheater (D), located at the furnace exit, and the primary superheater (E) in the back pass; economizer surface (F) below the primary superheater. For the period from August, 1949, to December 31, 1958, this unit had an average availability* of 94.5% and an average capacity factor** of 98.4%.

**Average Availability—In service or available. Not considered available while down for inspection or repair, or while in the process of starting up or shutting down.*

***Average Capacity Factor—Ratio of average hourly output—net kw—to rating of turbine-generator.*



These two recent reheat designs (left — natural circulation; right—controlled circulation) demonstrate the basic similarities between Combustion's first post-war reheat design, as represented by the Edgar installation, and its present-day reheat designs.

to Reduced Power Costs

The average rate of fuel consumption per kw-hr over the past decade has decreased from 1.30 lb in 1948 to .905 lb in 1958—a reduction of about 30 per cent. While an important part of this economic gain must be credited to the adoption of higher steam pressures and temperatures, the principal part has resulted from the widespread adoption of the reheat cycle.

C-E's role in the development and application of post-war reheat boiler design has been a major one. The first C-E unit of this design, ordered in 1947 by Boston Edison Company† for its Edgar Station, went into service in August, 1949. As of now—a decade later—a total of 279 reheat units, including 119 of the controlled circulation design, have been ordered by American utilities for an aggregate capacity of 39,100,000 kw. This is equivalent to more than one-third of the total steam-generated capacity of the utility industry as of the first of this year. Of the 279 units, 208, with a capacity of over 26,000,000 kw, are in service.

System generating costs are importantly affected by continuity of service of the more efficient units. The remarkably fine performance of C-E Reheat Units in this respect is evident from the records of 150 units, on which data are available from start-up dates to the end of 1958. The composite record of these units shows an average availability of 95.07% and an average capacity factor of 92.9%. The operating records of these units for the periods covered add up to a total of 560 boiler-years of service.

The consistently good performance records of C-E reheat installations is primarily attributable to the soundness of the original design concept. While numerous refinements and improvements of design detail have been made through the years, the basic arrangement of principal components has remained the same as evidenced by the accompanying drawings of the first unit (Edgar Station) and two recent units.

†Boston Edison also pioneered in the early development of the reheat cycle, having installed the country's first 1200-psi reheat boiler in 1925.

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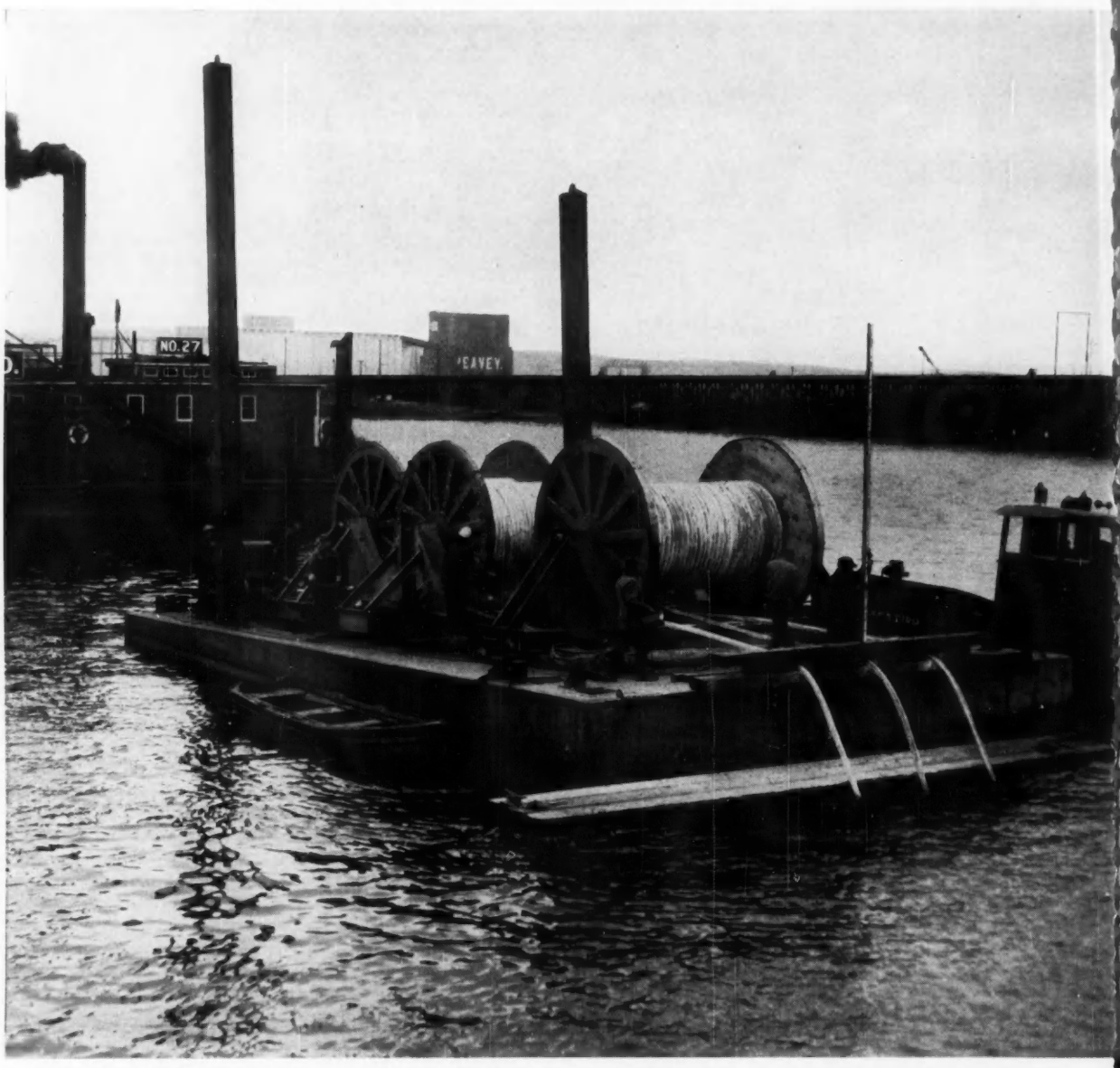

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2,000-foot reel of armored submarine cable 3½ inches in diameter made at the Worcester, Massachusetts plant of American Steel & Wire Division of U. S. Steel.

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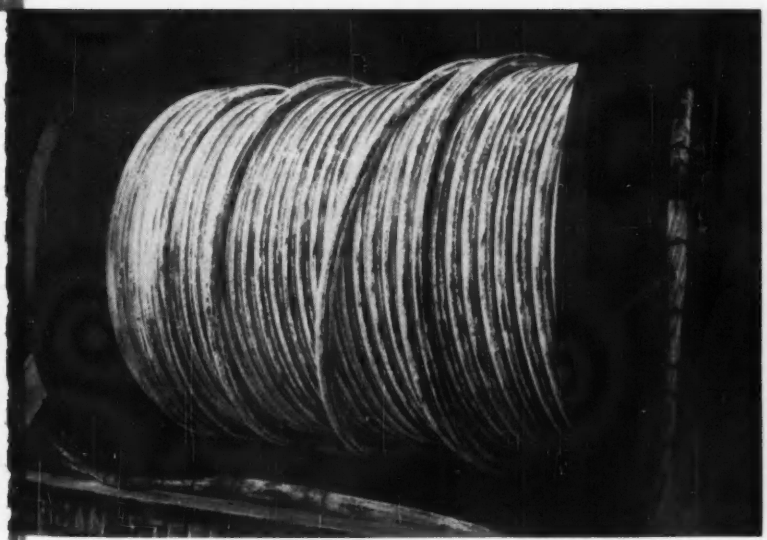

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Pole or crossarm mounting . . . Model 6601A

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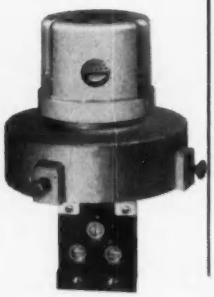
Ornamental pole top mounting . . . Model 6600A with S-485 adapter (adapter also available for poles with I. D. less than 3")



Bracket mounting . . . Model 6600A with S-487 clamp assembly.

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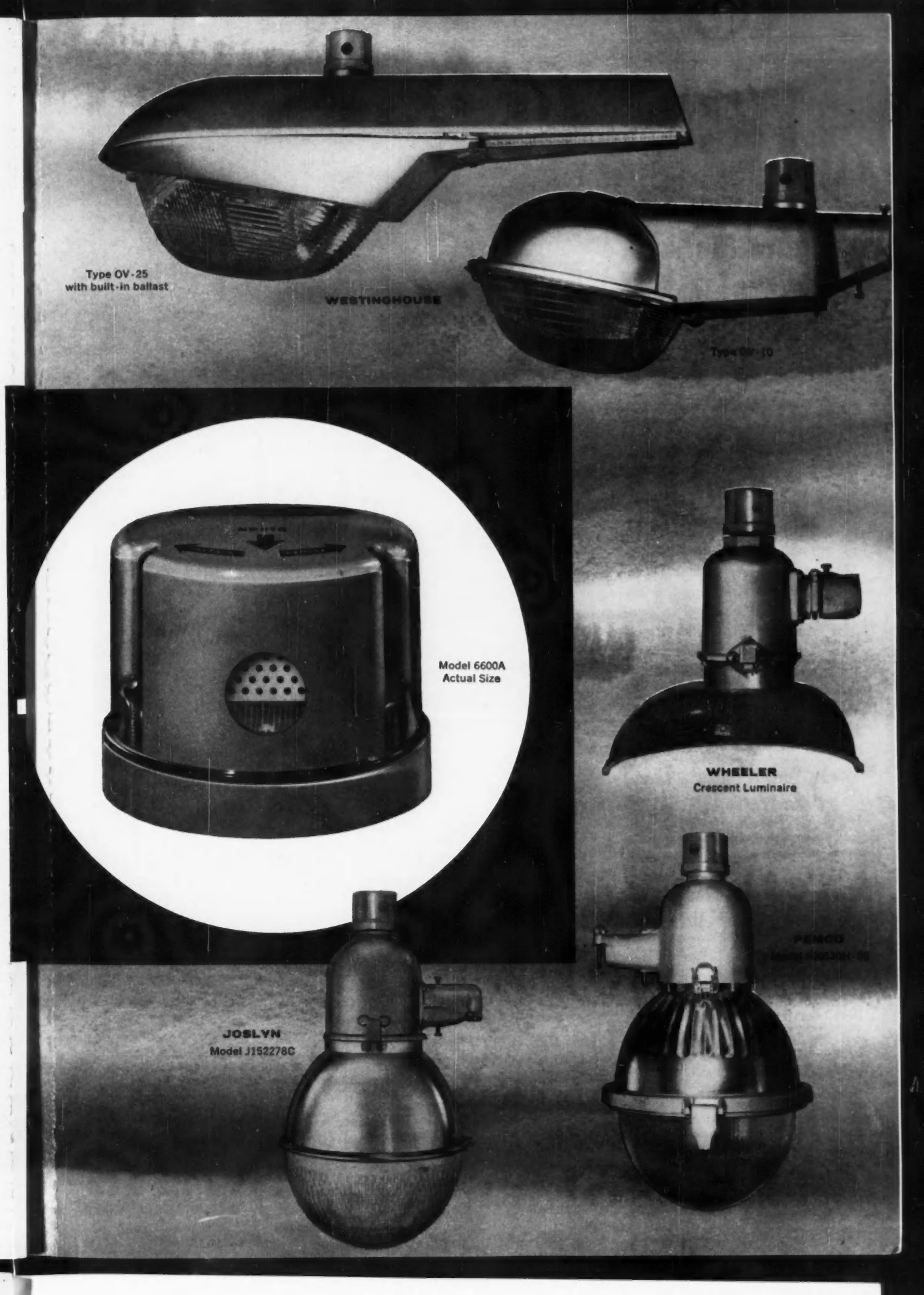
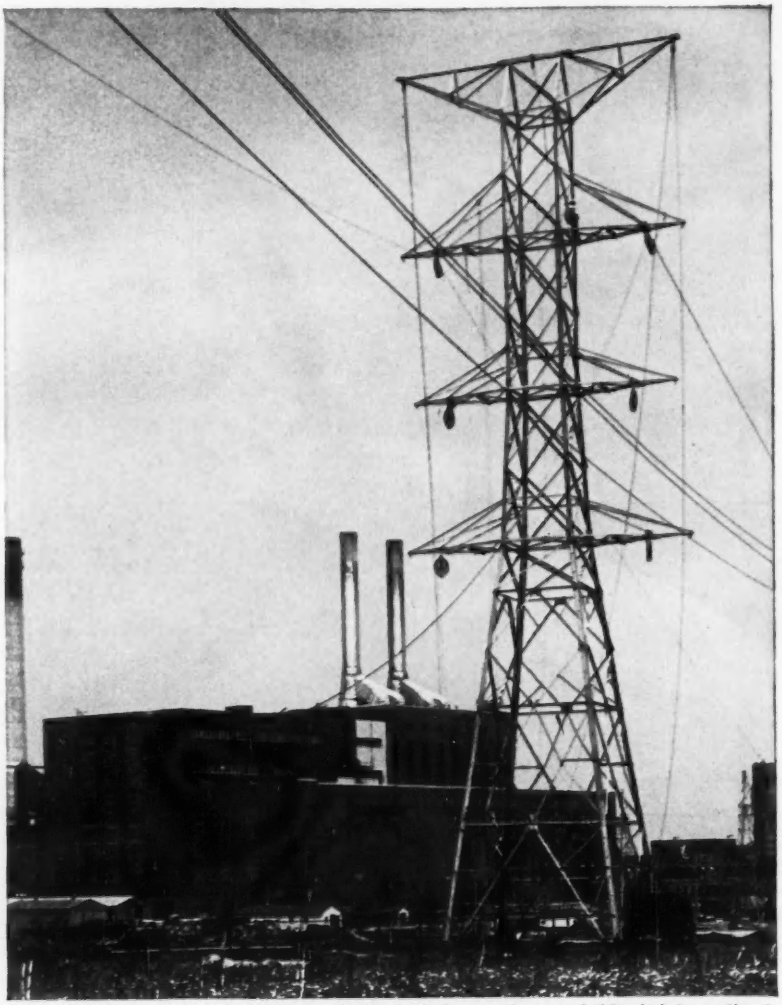
PHOTOELECTRIC LIGHTING CONTROLS

AN AFFILIATE OF SIGMA INSTRUMENTS, INC.


Type OV-25
with built-in ballast
WESTINGHOUSE
Model 6600A
Actual Size
WHEELER
Crescent Luminaire
JOSLYN
Model J152278C

New Capacity, New Lines, for Niagara Mohawk

New York utility adds 210,000-kw steam units to Dunkirk Station; builds 47-mile transmission line including thirty-seven Bethlehem Steel towers



Towers for Niagara Mohawk's new transmission line with the recently expanded Dunkirk Steam-Electric Generating Station in the background. Bethlehem supplied the steelwork for the original plant as well as the addition.

Things are humming on the Niagara Frontier. And it all adds up to increased demands on Niagara Mohawk Power Corporation for electric power to meet present and future needs. One phase of Niagara Mohawk's response dates back to 1950 when the utility constructed a 204,000-kw steam-electric generating plant on the shores of Lake Erie at Dunkirk, about 45 miles from Buffalo. In 1958 they undertook to triple the plant's output by adding two 210,000-kw units at a cost of some $75 million. Bethlehem Steel was called upon on each occasion to fabricate and erect the structural steelwork. Design engineer is Stone & Webster Engineering Corporation.

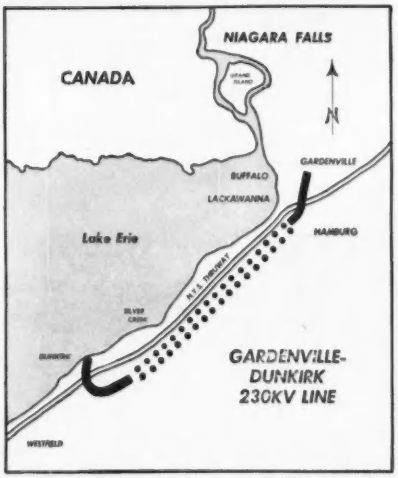
47-MILE LINE . . . In order to carry the Dunkirk Station's increased output to existing transmission facilities in the Buffalo area, the utility constructed a 47-mile 230-kv line. Paralleling the New York State Thruway for most of its length, it terminates at Niagara Mohawk's big Gardenville Transmission Station.

Both ends of the line, passing through built-up areas and requiring numerous road and railway crossings, utilize Bethlehem Steel galvanized towers. They are of double-circuit construction and provide average spans of 1,000 ft. The power conductors are 1,192,500-cm steel-reinforced aluminum cables. Two overhead ground wires are being used.

FABRICATED AT LEETSDALE . . . The 37 steel towers, designed by Niagara Mohawk's Western Division Engineering Department, were fabricated and galvanized at our Leetsdale Tower Shop, near Pittsburgh, Pa.

On the West Coast, transmission towers and substation structures are fabricated at our shops in South San Francisco and Seattle.

For further information, kindly get in touch with the Bethlehem sales office nearest you.



Heavy lines indicate the steel-tower sections of the Dunkirk-Gardenville 230-kv line.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

THE Pennsylvania NEWS

EXTRA

Published by Pennsylvania Transformer Division • McGraw-Edison Company • Canonsburg • Penna.

PENNSYLVANIA TRANSFORMER ANNOUNCES COMPLETE LINE OF SECONDARY UNIT SUBSTATIONS AND LOW VOLTAGE SWITCHGEAR

Products Include Indoor and Outdoor Substations, Articulated and Integrated

A complete line of secondary unit substations and low voltage switchgear assemblies is now being manufactured by Pennsylvania Transformer Division, McGraw-Edison Company. Products include both indoor and outdoor articulated and integrated substations.

Announcement of the new products was made by W. R. Swoish, vice president, who reported the opening of special departments to handle manufacture and sale of the products. Manufacturing facilities and offices are adjacent to the company's main transformer plant in Canonsburg, Pa.

Ratings from 75 through 2000 Kva

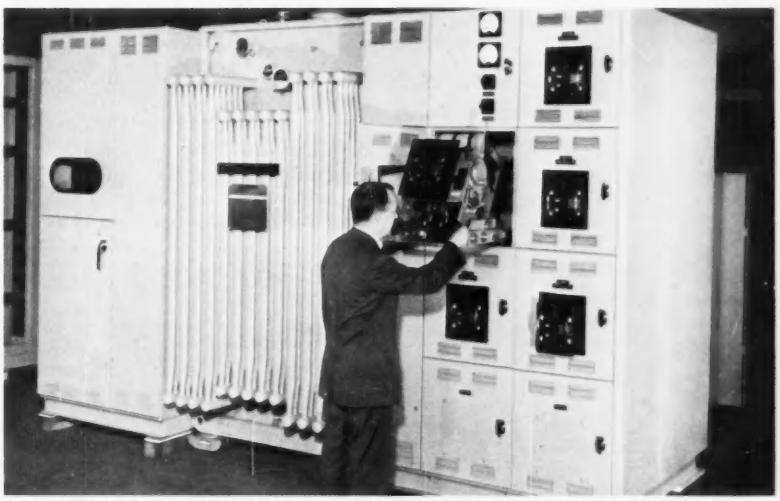
According to Mr. Swoish, Pennsylvania's new articulated substations, which consist of subassemblies for field connection, range from 112½ through 2000 kva. Integrated substations, which are completely assembled at the factory, range from 75 through 500 kva. Normal primary voltages are from 2400 through 13,800 volts, with secondary voltages 480 volts and below.

Substations may be equipped with any of several suitable transformers manufactured by Pennsylvania. Indoors, sealed dry-type, ventilated dry-type, or askarel-filled transformers are used. Outdoors, oil-filled transformers normally are used.

Switchgear Features "Tilt" Design

Outgoing feeder switchgear—normally of the 600-volt insulation class—may include either low voltage power circuit breakers or molded-case breakers. A feature of Pennsylvania's draw-out switchgear is a special breaker-tilting arrangement that provides easy access for adjustment of trip settings.

The various types of switchgear also are available as separate assemblies for subsidiary distribution centers.



Pennsylvania's Transformer's new line of secondary unit substations includes both indoor and outdoor substations, both articulated and integrated designs. Pictured is a 1000-kva articulated, indoor substation rated 4160—480Y/277 volts. The substation includes a primary, fused, air interrupter switch, an askarel-filled transformer, and secondary drawout switchgear with a special "tilt" breaker design.

J. J. Zimsky

T. S. Banghart

Sales, Production Heads Named for Pennsylvania's Unit Substation Department

A product manager and a sales manager have been named for Pennsylvania Transformer's new secondary unit substation department. Product manager is J. J. Zimsky, who formerly headed the company's planning department. Sales manager is T. S. Banghart, whose experience includes six years as switchgear application engineer.

Introduction of New Products A Habit at Pennsylvania

A check of the records today revealed that new product announcements are by no means uncommon at Pennsylvania Transformer Division, McGraw-Edison Company. Counting the latest announcement, regarding secondary unit substations and low voltage switchgear, at least three such announcements have been issued by the Canonsburg, Pa., manufacturer within little more than a year.

The other two announcements involved the Pole Star Regulator (introduced in 27 single-phase distribution ratings) and the Pennsylvania Phase-Isolated Load Tap Changing Transformer. A Pennsylvania innovation, the Phase-Isolated LTC is a three-phase transformer that features individually controlled voltage regulation for each phase.

In addition to secondary unit substations and low voltage switchgear, Pennsylvania products now include a complete line of transformers and regulators, from the smallest pole-type to the largest station units being made today.

(Advertisement)

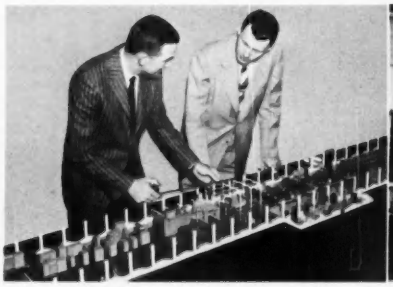
PENNSYLVANIA UNIT SUBSTATIONS DESIGNED, ENGINEERED AND MANUFACTURED UNDER 1 ROOF

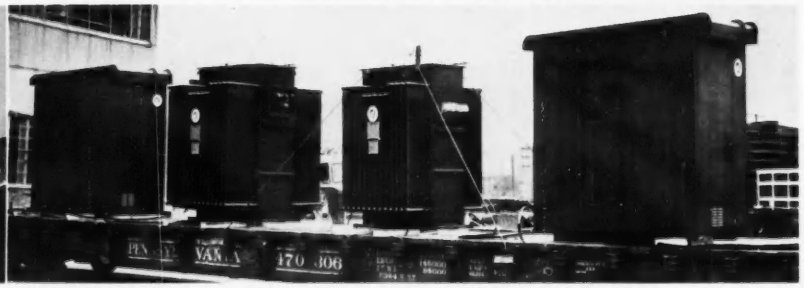
Centralized Responsibility Assures Coordinated Shipment

From development to production, all components of Pennsylvania Secondary Unit Substations are designed and engineered under one supervisory helm. Switchgear and transformers are sure to complement each other in both appearance and quality. In addition, ease of field installation is assured.

With manufacturing and assembly of all switchgear assemblies and transformers being handled at one plant, completely coordinated production is assured. All components can be shipped together, thereby avoiding delay at the installation site.

A portion of Pennsylvania's unit substation production floor, showing some of the sheet-metal-working machinery in the foreground.





Above left: Before beginning actual work on Pennsylvania's unit substation and switchgear facilities, special engineers and planners studied scaled model layouts as shown here. Above right: Coordinated shipment of substation components is the rule at Pennsylvania Transformer. Switchgear assemblies and transformers are produced at the same plant.

Equipment Laid Out for Streamlined Production Flow

A highly efficient, completely new production-line arrangement has been established for Pennsylvania unit substations and switchgear. All equipment and layout requirements were predetermined by specialized engineers and planners.

Detailed models of all equipment, arranged in a scaled factory layout, were of tremendous benefit, the company reports, in determining the choice of machinery, the flow of materials, and even the selection of colors for equipment and walls.

OVER 30 YEARS' EXPERIENCE IN TRANSFORMER MANUFACTURE INCLUDES MANY SUBSTATION APPLICATIONS

In more than 30 years of transformer design and manufacture, Pennsylvania Transformer Division, McGraw-Edison Company has produced every type of transformer from small distribution pole-type units to the largest size power transformers. To date, transformers have been manufactured in capacities over 300,000 kva and in voltages up to 460 kv.

Many transformers have been produced in the past for use with secondary unit substations assembled by other switchgear manufacturers. Thus, Pennsylvania enters the secondary unit substation field with a substantial store of information and experience regarding the applications involved.

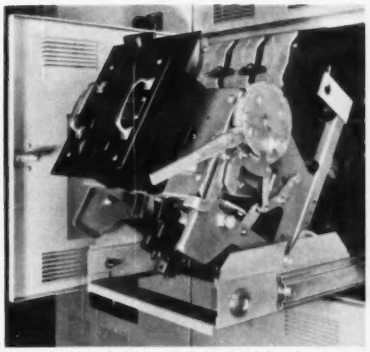
Production of LTC Equipment Prepares Personnel for Manufacture of Secondary Unit Substations

In addition, Pennsylvania Transformer has a nationwide reputation for quality in various other related fields, such as the design and manufacture of load tap changing equipment and other types of transformer switches. Single circuit primary unit substations have been a Pennsylvania product for many years.

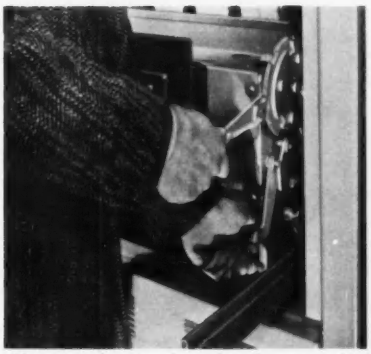
Experience from the manufacture of such a wide variety of equipment has developed in Pennsylvania a large pool of engineering knowledge and production know-how. Personnel has been well trained to handle the manufacture of secondary unit substations.

Pennsylvania Transformer Assumes Complete Responsibility for Materials and Workmanship

The Pennsylvania Transformer Division of McGraw-Edison Company assumes full responsibility for all materials and workmanship in its new line of secondary unit substations. The company points out that this is the long-established policy for all Pennsylvania products.



Breaker withdrawn and tilted back to give easy access to trip units without completely removing breaker element from carriage.



Close-up showing how breaker is racked into connected position. Breaker must be opened and positive interlock released before breaker can be moved.

Tilt-back Feature Facilitates Inspection and Maintenance

Several unique features have been incorporated in the design of Pennsylvania's draw-out carriage and racking mechanisms for power circuit breakers.

In the withdrawn position, the breaker can be tilted back on its rear trunnions so that the trip elements and other parts below are easily accessible for maintenance and adjustment.

The racking mechanism is operated with a self-storing captive handle. Not only are positions positively indicated, but also the mechanism is positively locked in all positions: "CONNECTED," "TEST," and "DISCONNECTED" — and the breaker cannot be closed between these positions.

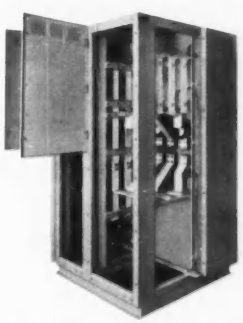
Before the racking mechanism can be operated, it must be unlatched with a finger lever. Movement of this latch is blocked when the breaker is closed. In any intermediate position of the racking mechanism, the trip lever is held in the operated position, preventing closure of the breaker.

The compartment door can be closed with the breaker in any position. A frame, under spring pressure around the mechanism throat, moves back, allowing the mechanism to extend beyond the compartment.

L V Switchgear Assemblies Are of Unitized Construction

Indoor assemblies for the outgoing feeders of Pennsylvania secondary unit substations are of sectional construction, with a stack of breakers in the front compartment and a bus structure in the rear. All parts are made of formed, sheet steel, spot welded together when possible for utmost strength and rigidity. Sections, as required, are bolted together and to a rigid, structural-steel base frame designed to permit easy movement of the equipment.

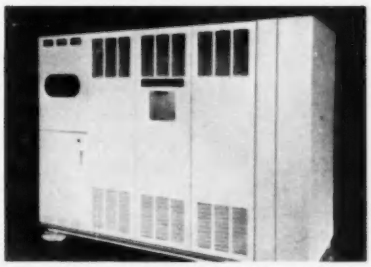
When the switchgear is for outdoor installation, a weatherproof outer "skin" is added to provide an operating and maintenance aisle in front of the breakers. All joints of this outer steel inclosure are gasketed to make them water- and dust-tight. Doors, equipped with 3-point latches and 3-point hinges, are fully gasketed. Ventilating openings have metal filters that are easily removed for cleaning.



Rear view of main breaker compartment.

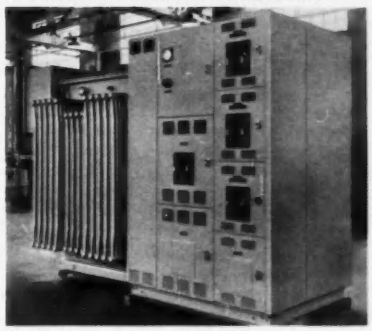
Outdoor switchgear with walk-in aisle.

Indoor Integrated Substation



Pennsylvania secondary unit substation rated 500 kva, 2400 — 208Y/120 volts. The transformer is a ventilated dry-type.

Indoor Articulated Substation



1000 kva, 4160—480Y/277 volt substation, with askarel-filled transformer, 1600-ampere main secondary and 600-ampere feeder breakers.

Outdoor Articulated Substation

This outdoor substation with oil-filled transformer is rated 1500 kva, 12,470—480Y/277 volts.

Complete Range of Sizes Now Available

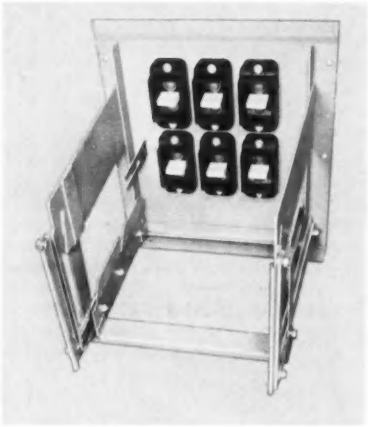
The new line of secondary unit substations announced today by Pennsylvania Transformer Division includes both indoor and outdoor types, articulated and integrated design. Available sizes are:

Articulated—112½ through 2000 kva

Integrated—75 through 500 kva

Supply-side voltage ratings normally are from 2400 through 13,800 volts, with load-side voltages 480 volts and below.

Vacant Breaker Position Easily Converted for Use



Front view, circuit breaker cradle and carriage assembly.

Breakers can be easily installed in the vacant compartments of Pennsylvania secondary unit substations. The blank back plate is removed, permitting a jig-assembled breaker cradle and carriage to be inserted and bolted into place. Jumper bars are installed between the bus and the stationary breaker terminals of the cradle.

If desired, any compartment can be equipped with a cradle and carriage already installed, and the breaker element can be added when needed.

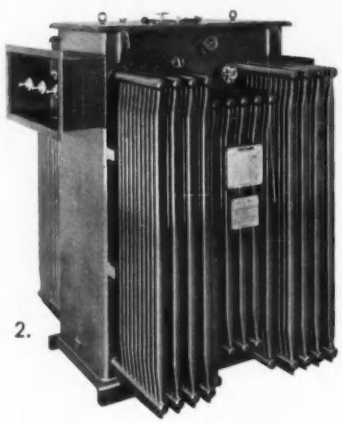
Variety of Incoming Line Sections Available

Outdoor fused interrupter switch with weather-protected aisle.

Supply circuits for Pennsylvania secondary unit substations can be terminated in any one of several types of primary switchgear, the company reports. Frequently used is an air interrupter disconnect capable of opening the normal load on the substation. Power fuses are often included with the switch. Lightning arresters can be connected to these circuits for protection of the transformers.

Fused switches are arranged so that the fuses are not accessible until the switch is opened. Outdoor inclosures have weather-protected aisles to permit maintenance and changing of fuses during adverse weather.

1.



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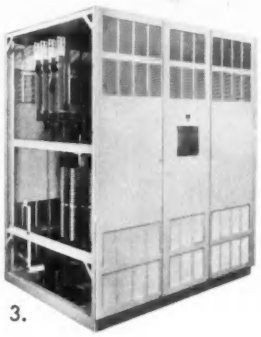


3.

1. *Sealed dry-type transformer with low voltage throat for connection to switchgear.*
2. *Oil-immersed, self-cooled transformer with high and low voltage throats. Can be supplied with flanges for close coupling to switchgear. (Askarel-filled transformers are similar in appearance to oil-filled units.)*
3. *Ventilated dry-type transformer, showing low voltage end for connection to switchgear.*

Four Main Transformer Types with Selection Depending on Application

The location and conditions of the installation determine the type of transformer selected for Pennsylvania secondary unit substations.

For indoor installation, dry-types are commonly used — either open ventilated or sealed. Another type used with indoor substations is the askarel-filled transformer. Each of the three has its own special qualifications for particular locations.

For outdoor installations, oil-filled transformers are used most often. Under special conditions, it is advisable to use askarel-filled or sealed dry-type transformers.

Pennsylvania . . . A Leading Manufacturer of Transformers for over 30 Years

Since the company was founded in 1929, Pennsylvania Transformer has grown steadily, during the years of the depression as well as in the boom times that followed. From the standpoint of quality as well as production, it has maintained its position as one of the leading transformer manufacturers in the country.

Pennsylvania Transformer became a division of McGraw-Edison Company in 1952. All manufacturing facilities—comprising nearly one million square feet—are located in Canonsburg, Pa., 18 miles south of Pittsburgh. The plant is shown at left.

Write for Copy of Pennsylvania Secondary Unit Substation Book

This well-illustrated 44-page booklet contains descriptions of secondary unit substation and switchgear components, as well as application data. Write on your company letterhead.

PENNSYLVANIA TRANSFORMER DIVISION
McGRAW-EDISON COMPANY, CANONSBURG, PA.

McGRAW EDISON

The Electrical Week

FUTURE NEWS ▶ **Look for lengthy statements on Russian-U. S. power situation** to be made by 11-man team on recent government-sponsored tour of Soviet power facilities. Statements, to be compiled and released as an official report to the Senate, will probably emphasize hydro.

LATE NEWS ▶ **Oregon PUC auditor challenges utility "political expenses"** at Pacific P&L rate hearing. Albert Wickert testifies that of 29 ads, PUC considered 12 to be legitimate operating expenses while 17 were not. "We recognized in general the utility's right to meet competition by advertising, but those (ads) of a political nature we felt should be charged off to stockholders rather than rate-payers."

Rural Electrification Administration plans May 11 press reception in Washington to mark REA's 25th anniversary. Also, the agency is producing a book and a film on rural electrification's impact on farm people.

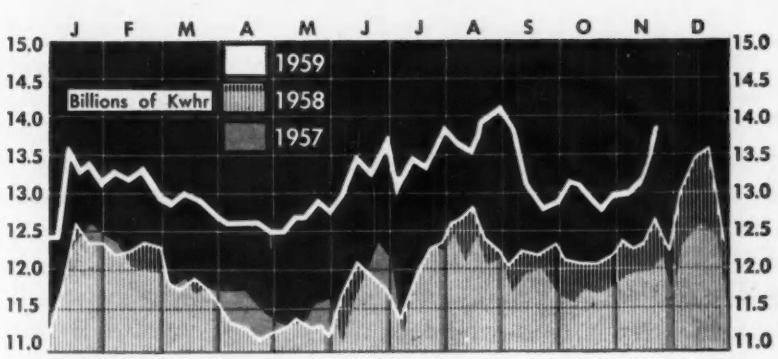
Sen Estes Kefauver writes IRS commissioner Dana Latham that he is "urgently opposed" to proposed new IRS regulation dealing with federal income taxes for contributions to political activities and "propaganda" advertising on the basis that the new rule, though much stiffer than its predecessor, is too limited in scope.

Westinghouse increases power transformer prices 10% above "recently obtained prices", but says new prices will be lower than those in effect many months earlier. GE is studying the situation.

Management changes . . . E. H. Hill to become VEPCO chairman Jan. 1, succeeding D. C. Barnes who will become honorary chairman.

Obituary . . . Edith Clarke, 76, retired GE engineer and first woman to get EE degree from MIT.

WEEKLY POWER OUTPUT—Up 9.8% (Week ending Nov. 21), Kwhr 13,812,000,000



Per Cent Change From Previous Year

	Nov. 7	Nov. 14	Nov. 21
Total U. S.	+ 5.8	+ 7.2	+ 9.8
New Eng.	+ 3.7	+ 4.6	+ 6.9
Mid. Atlan	+ 5.5	+ 6.8	+ 9.4
Cent. Ind.	+ 2.1	+ 6.8	+10.4
West. Cent.	+ 6.3	+ 9.3	+11.1
Southeast	+ 6.7	+ 7.6	+11.3
South Cent.	+11.2	+ 5.9	+ 7.7
Rocky Mount	+ 4.4	+ 0.6	+ 4.9
Pacific NW	+ 7.6	+10.1	+10.4
Pacific SW	+ 9.9	+10.0	+ 9.3

Seasonally Adjusted Index 260.3
Week Ago 251.3 Year Ago 236.8

Source: Edison Electric Institute

Preview of this issue

EVENTS ▶ **Ten power companies join Avco Corp in "hot gas" research** to develop more efficient power source using principles of magnetohydrodynamics (MHD), in which superheated ionized gas substitutes for a generator armature **(p 76)** . . . Public-vs-private power hassle reached a fever pitch in recent elections, with systems changing hands both ways **(p 77)** . . . ECAP case before FPC got rolling last week, but progress is being marked by objections from both power companies and the FPC staff; a court test seems to be in the making **(p 79).**

ENGINEERING ▶ **Digital computers give economic loading for distribution transformers** and secondaries, Cleveland Electric Illuminating Co report shows. The computer is used to analyze pertinent variables **(p 83)** . . . Five investor-owned utilities propose 230-kv multiple-line transmission to U.S. Bureau of Reclamation for five-state Rocky Mountain area **(p 86)** . . . Neon lights are developed for Bonneville Power Administration and Washington State College for warning airplane pilots away from high-tension lines **(p 90)** . . . Low profits and government domination of nuclear technology are complaints voiced at Atomic Industrial Forum recently in Washington. Delegates hear McCone's observations on his USSR tour and the speed with which the Russians are reaching their objectives **(p 138)** . . . Nine improvements are incorporated in

Politics and Public Power

POLITICS OF AN ELECTION YEAR

The political requirements of an election year are winning out over at least one policy of the Eisenhower Administration: That of "no new starts" on public works.

Interior Secretary Fred Seaton tipped the President's hand last week in a press conference by stating that the Administration will ask Congress in its next budget to vote funds to start construction at several already-authorized projects.

This decision to bend with the wind has more significance than the dollars it may add to the anticipated all-time high public works budget for fiscal year 1961.

It will give the Administration two stronger talking points: (1) Proof that the GOP doesn't oppose expansion of federal Public Works programs as such; (2) A positive GOP proposal for federal developments that will help counter the expected bundle of new starts to be proposed by the Democrats in Congress.

The action also is realistic. Another Administration request for no new starts probably would suffer the same fate in 1961 as it did this year—when Congress overrode Eisenhower's veto of the Public Works Appropriation bill which included 67 new starts.

Seaton told reporters that he never has opposed the "no new starts" philosophy—he and the Administration just wanted a "breathing spell" for a couple of years. He admitted this spell didn't last as long as he would have liked and then he commented, surprisingly, "We didn't get the number of new starts voted by the Congress last year that Congress might have dreamed up, so we are in the position now to advocate some more, which we shall do . . ."

Wisconsin P&L's new filter-press equipment for insulating oil maintenance **(p 99).**

PROCUREMENT & PRODUCTS ▶ **Steel strike results in deferrals of new machinery orders** . . . Copper prices jump to average 35.225¢ lb . . . Aluminum production is cut back after reaching toward a record high in October **(p 106)** . . . Allis-Chalmers markets all-aluminum switchgear housings . . . Okonite ships 345-kv cable to Cornell U. for joint AEIC-EEI study **(p 108)** . . . New line of distribution transformers through 500 kva are now available . . . Communications towers of tubular alloy steel come in heights from 10 to 500 ft **(p 112).**

MANAGEMENT ▶ **Profits are the key to progress in regulated industry** as well as non-regulated businesses. A detailed study by American Telephone & Telegraph Co backs up this statement with facts, and makes a convincing case showing the need for higher utility earnings. For the first of three articles on the AT&T study, turn to **page 119.**

SELLING ▶ **Illuminating Engineering Society learns latest lighting developments** at its meeting in San Francisco. Papers cover everything from integrated lighting and air conditioning to highway lighting **(p 127).**

This actually is the second time this year that Seaton has mentioned the possibility that the Administration might request funds to start new projects. However, the earlier request was intended only as an alternate plan, in a futile attempt to halt the tidal wave of 67 new starts voted by Congress.

Seaton's admission also indicates that Congress, by finally overriding an Eisenhower veto, also broke the Administration's control over such controversies. The White House is forced now to play along.

Although Seaton didn't name any or how many reclamation projects he was speaking of, the answer is fairly simple. He pointed out that all requests would be for projects already authorized by Congress—about 10 in number.

Only three of these involve power: Blue Mesa and Morrow Point dams on the Gunnison River, Colo., part of the Curecanti unit of the Upper Colorado River Project; and Yellowtail Dam on the Big Horn River, Wyo., part of the Missouri River Basin Project.

The other side of the coin is that new starts on the Corps of Army Engineers projects will also be recommended.

Out of nearly 450 already-authorized projects for the Engineers, about 17 would contain power facilities.

Not all these projects will be requested by the Administration, but some will be—and a Democratic Congress will add projects of its own to the list the Administration proposes.

With elections close at hand, the Republican Administration and a Democratic Congress are both aware of the vote-getting appeal of a well-placed pork-barrel project. It could affect the choice of Congressmen and Senators, as well as the next President.

Executive Reader

A critical look at the management of some rural electric cooperatives is being taken by friends of rural electrification who also support the 2% interest rate. They are particularly concerned with what appears to be a reasonably high percent of reserve funds being held in government bonds. There is no quicker, surer way to lose public support than for the word to be nosed around that co-ops are borrowing money at 2% and investing in government bonds at 3% or better. A lack of judgment in the handling of reserves properly and keeping reserves at a reasonable level can do more harm in the field of public relations than all the money that can ever be spent in overcoming the situation. **Cornbelt Comments, Carl Hamilton, Rural Electrification, October, 1959.**

Primary distribution at 23-26 kv is under study by two large utilities which have retained 4 kv for lack of a suitable and higher existing voltage. The interest in higher voltage reflects a desire to eliminate the cost of conventional distribution substations and a growing conviction, based upon reported success of 12 and 13-kv systems, that the next higher voltage level might prove feasible.

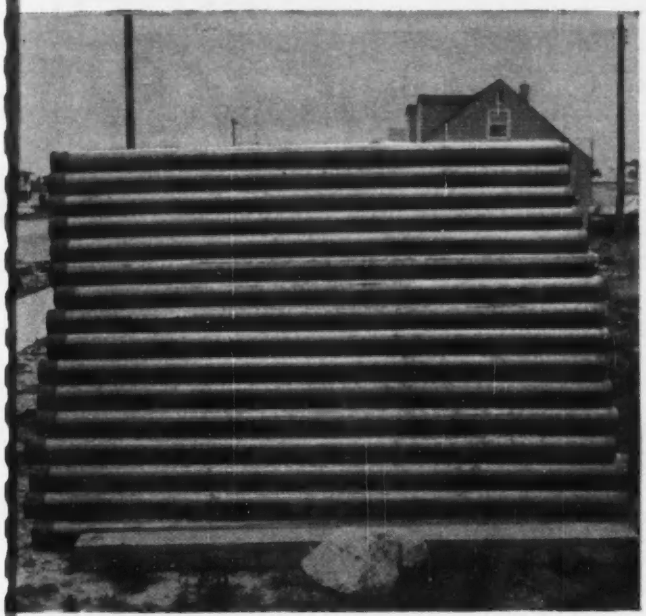
Sustained meter accuracy is recognized in new testing rules published recently by the Missouri Public Service Commission. The new rules extend to 240 months the permissible period without test for induction-type watthour meters manufactured since 1937. They also waive the initial service test on new meters if they go into service with the maker's seal unbroken.

Automatic chemical analysis equipment is available that will perform many of the chemical analyses usually done by the plant chemist. Correlation of data from various automatic analysis instruments and the determination of changes in control set points through the use of a digital control computer is a future possibility. **Automatic Control of Cooling Tower Water Quality, John K. Kintigh, 1959 National Power Conference, Kansas City, Mo.**

Programmers and system operators for digital computer installations are selected on the basis of a five-test battery by the Naval Supply Depot, Great Lakes, Illinois. Applicants who pass the Civil Service Test 105 are given these tests: Quantitative reasoning (test 56b), outline completion (74), abstract reasoning (57a), stock record keeping (70a), and following oral directions (135). Information on these tests may be obtained by contacting **Second Region, U. S. Civil Service Commission, Federal Building, Christopher St, New York 14, N. Y.**

A world's record for overhauling a 60-Mw turbogenerator and boiler set in five days is claimed by engineers at Hams Hall Power Station, Birmingham, England. Nine days were cut from the previous record through advance scheduling to cut stoppages and waiting time. Unlimited labor was available to work continuously in two 12-hr shifts per day. The rapid overhaul saved about $28,000 in fuel costs. **McGraw-Hill World News, London.**

Flush-Fit Couplings on L-M Permaline Conduit Provide Big 3-Way Savings



SAVINGS IN STORAGE are realized since the coupling is attached to the conduit. Coupling cartons are eliminated.

Big savings are possible with L-M Permaline Conduit and the Flush-Fit Coupling. The couplings are installed at the factory on one end of each 2, 3, 3½, 4, 4½ and 5-inch sizes of Permaline Conduit. Thus, you save in three important ways since the coupling and conduit are bought, stored and installed as one complete unit:

Savings in Storage . . . coupling cartons are eliminated.

Savings in Handling . . . coupling and conduit are one unit.

Savings in Installation . . . coupling is already attached; no couplings to attach on the job site.

L-M Flush-Fit Couplings have the same outside diameter as the conduit. Joints do not have to be staggered. You install Permaline conduit as fast as you can get it into the trench.

Other Permaline Advantages

Permaline Conduit offers many other time and money-saving advantages:

Smoother Inner Bore . . . Faster, trouble-free cable pulling.

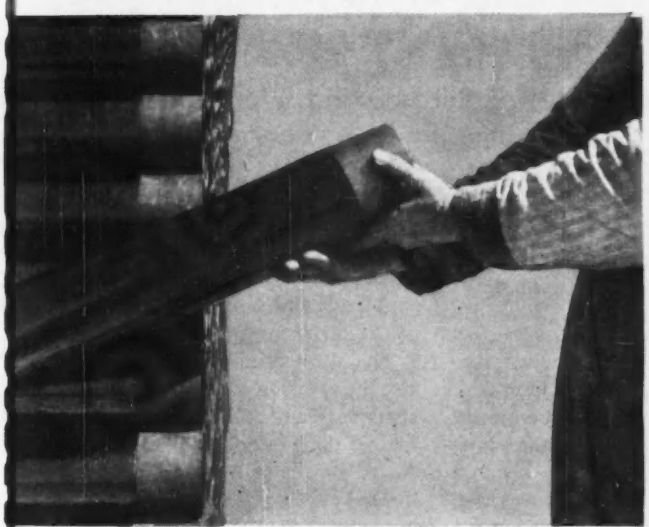
Choice of Shipping Methods . . . Bulk, fork-lift bundles or steel-strapped slings for fast, easy handling.

Complete Line . . . All sizes; 5, 8 or 10-foot lengths; all accessories.

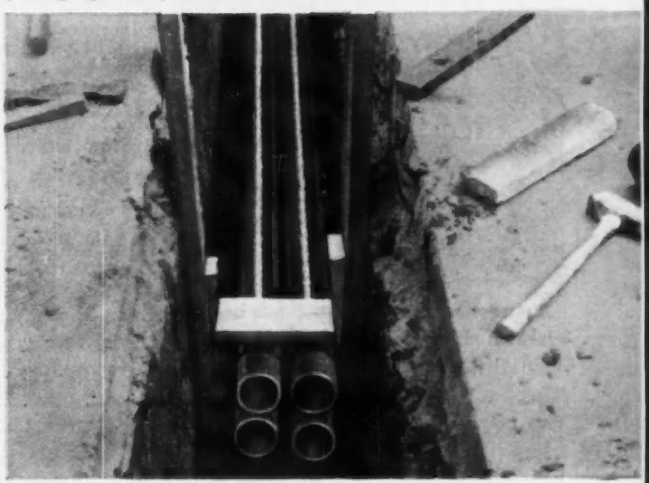
Complete Stocks At Strategic Warehouses . . . One is conveniently located near you.

Exceptional Service . . . More than 100 Permaline representatives in the U. S. ready to serve you.

Engineering Service . . . Complete technical assistance on your proposed system.



SAVINGS IN HANDLING are possible because the coupling is attached to the conduit at the factory. No cartons to check in and out of your warehouse.



SAVINGS IN INSTALLATION are possible because coupling and pipe are taper-fitted, and need only be driven with wood block and hammer to provide tightest possible joint.

Get Complete Information . . . For complete information on Permaline Conduit with Flush-Fit Couplings or any Permaline product, contact your L-M Field Engineer or Permaline Specialist; or, write Line Material Industries, Milwaukee 1, Wisconsin; ask for a copy of L-M's Underground Construction Handbook, 12-point Plan Folder and Permaline Conduit Bulletin UG1A. In Canada: Canadian Line Materials, Division of McGraw-Edison Company (Canada), Limited, Toronto 13, Ont.

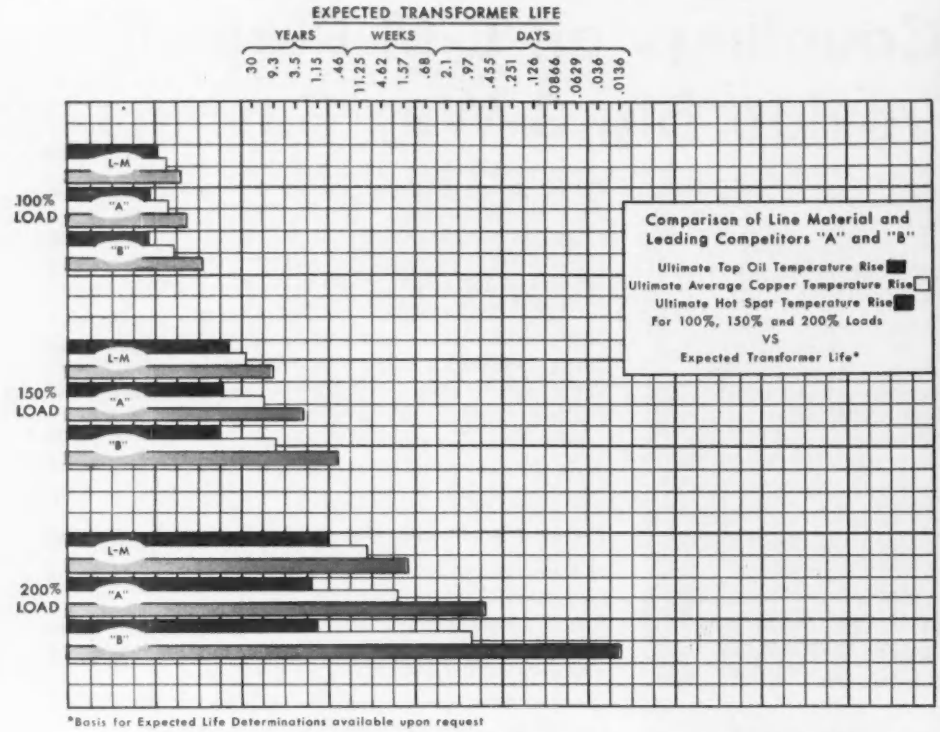
LINE MATERIAL Industries

McGRAW-EDISON COMPANY

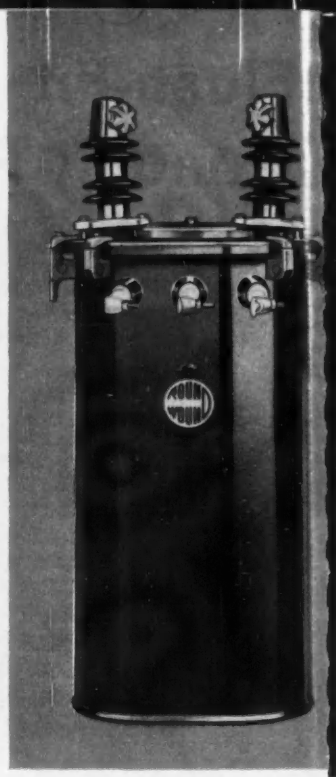
427

Permaline Fibre Conduit

DISTRIBUTION TRANSFORMERS • KYLE RECLOSERS AND OIL SWITCHES • FUSE CUTOUTS AND FUSE LINKS • LIGHTNING ARRESTERS • POWER SWITCHING EQUIPMENT
PACKAGED SUBSTATIONS • CAPACITORS • REGULATORS • OUTDOOR LIGHTING • LINE CONSTRUCTION MATERIALS • PORCELAIN INSULATORS • FIBRE PIPE AND CONDUIT



*Basis for Expected Life Determinations available upon request



BASED ON AIEE TRANSACTION PAPER, "Life Expectancy of Oil Immersed Insulation Structures," volume 72, pages 924-29, and laboratory tests, transformer life can be estimated by comparing bar length with scale at top. (Note: the longer the bar, the shorter the life.)

L-M Increases Secondary Breaker Setting

Low winding and insulation temperatures permit uprating L-M transformers without any sacrifice of transformer life expectancy.

by **A. R. WAEHNER**
Director
Transformer Product Sales
Line Material Industries

During the past year, much has been claimed about improved transformer insulating materials and systems. This has led to confusion and justified concern on the part of many users who are interested in the long life of distribution transformers.

The anticipated life of a transformer is not governed *solely* by the insulating materials used therein—but, just as importantly, by the temperatures at which they operate. The *design* of the core and coil structure that permits the *most rapid removal* of the heat generated within the winding results in the lowest insulation temperature.

Rapid extraction of heat from the vulnerable areas of the coil reduces the internal copper temperature that causes insulation deterioration, thereby extending life expectancy.

High Top Oil Temperature

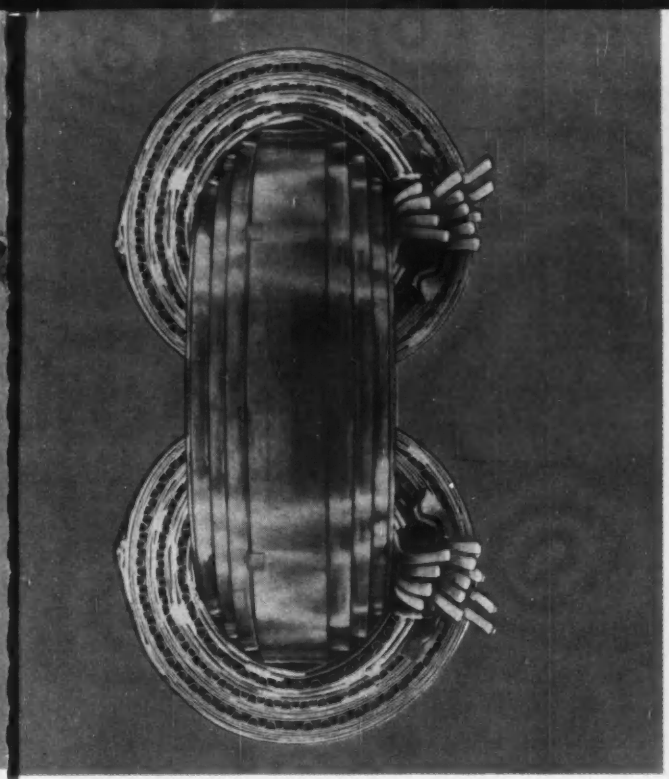
The inherent characteristics of the Line Material Round-Wound® design create *higher* top oil temperatures and lower copper temperatures than in other designs with the same total losses. This is an *advantage* and not a *disadvantage*, as it proves the rapid removal of internally generated heat. Just as hot beverages placed in a thermos jug cool slowly, in like manner other designs of cores and coils restrict the release of generated heat to a greater degree than in the Round-Wound design. Because we transfer heat to the oil more rapidly, the Round-Wound hot spot temperature is reduced, overload capacity is increased, insulation is not jeopardized, and life expectancy is extended.

Another advantage of higher top oil temperature is the more rapid dissipation of transformer heat because of the *higher* gradient between tank wall and ambient temperature of the surrounding atmosphere.

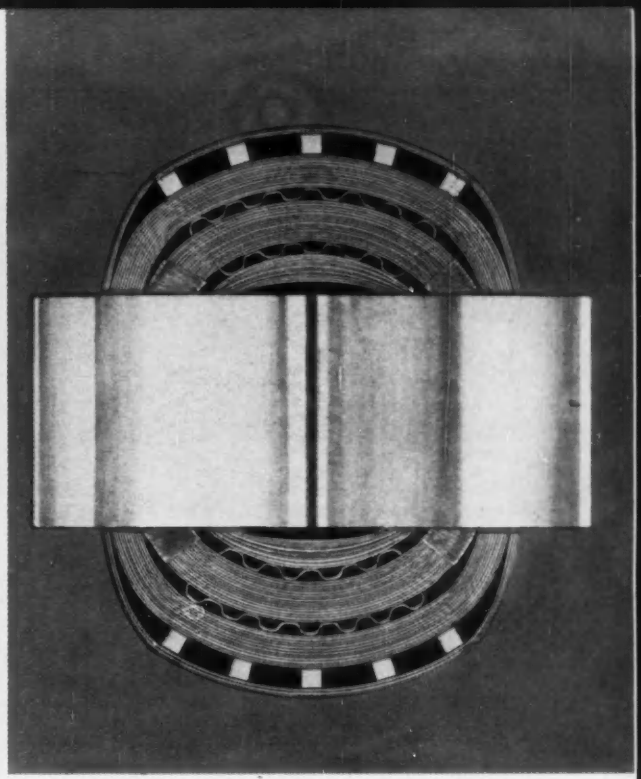
The illustrations on these pages clearly reveal a vastly greater percentage area of coil exposure to cooling oil than in competitive designs. Note, also, the many strategically located cooling ducts.

Low Temperature Gradient

Fast heat transfer in a Round-Wound core and coil rapidly raises top oil temperature *closer* to the hot spot temperature. The degrees difference is known as "temperature gradient" and is lower in the Round-Wound design than in any other make of core or shell type transformer available today. Low temperature gradient is a most significant factor contributing to long transformer life,



THIS END VIEW shows how L-M's exclusive Round-Wound design permits more oil ducts and exposes maximum cooling surface area. Winding heat is transferred more effectively than by other designs.



THIS END VIEW shows how shell type window dimensions prohibit oil ducts on the inside where heat build-ups occur. Only L-M's Round-Wound design provides concentric cooling.

on Round-Wound-Protected Transformers

especially at times of heavy overload when transformers are most vulnerable to high insulation temperatures. To take the ideal condition, if the gradient were zero degrees, heat would transfer instantly, top oil temperature would be higher, hot spot temperature would be lower, and the ultimate in life expectancy would be attained.

Laboratory tests of modern competitive samples compared with the Round-Wound design prove conclusively that at periods of heavy overload, the Round-Wound hot spot temperature is lower than with any other modern competitive design. In fact, it is *less* than the average copper temperature of at least one leading make of transformer. This is dramatically revealed in C. R. Acker's technical article in the September-October, 1959 issue of THE LINE Magazine.

Continuing Research

As a pioneer in long insulation life, Line Material, in 1951, was the first manufacturer to introduce oxidation resistant transformer oil (ORTO®). Our research and design engineers, with the assistance of Thomas A. Edison Laboratories, maintain a continuing search for improved insulation systems. If and when we find a better system, we will adopt it. The insulation system employed in the Round-Wound design, since its inception, is the finest available. The Round-Wound transformer you buy today will provide equal or greater life, under any comparable loading conditions, than any other transformer available in the industry today, *without* the necessity of a design change.

Higher Secondary Breaker Settings

Throughout the years, our Round-Wound units have enjoyed liberal overload capacity with breaker settings in line with those dictated by the current usage in the industry. Our RWP® breaker settings have been recalibrated to be as high as or higher than those offered by any other major manufacturer today. Transformers with this new breaker calibration will be identified with this symbol ‡ following the Kva designation.

The same confidence in the longevity of Round-Wound conventional transformers may be expected because the core-and-coil designs are identical.

Get Complete Information

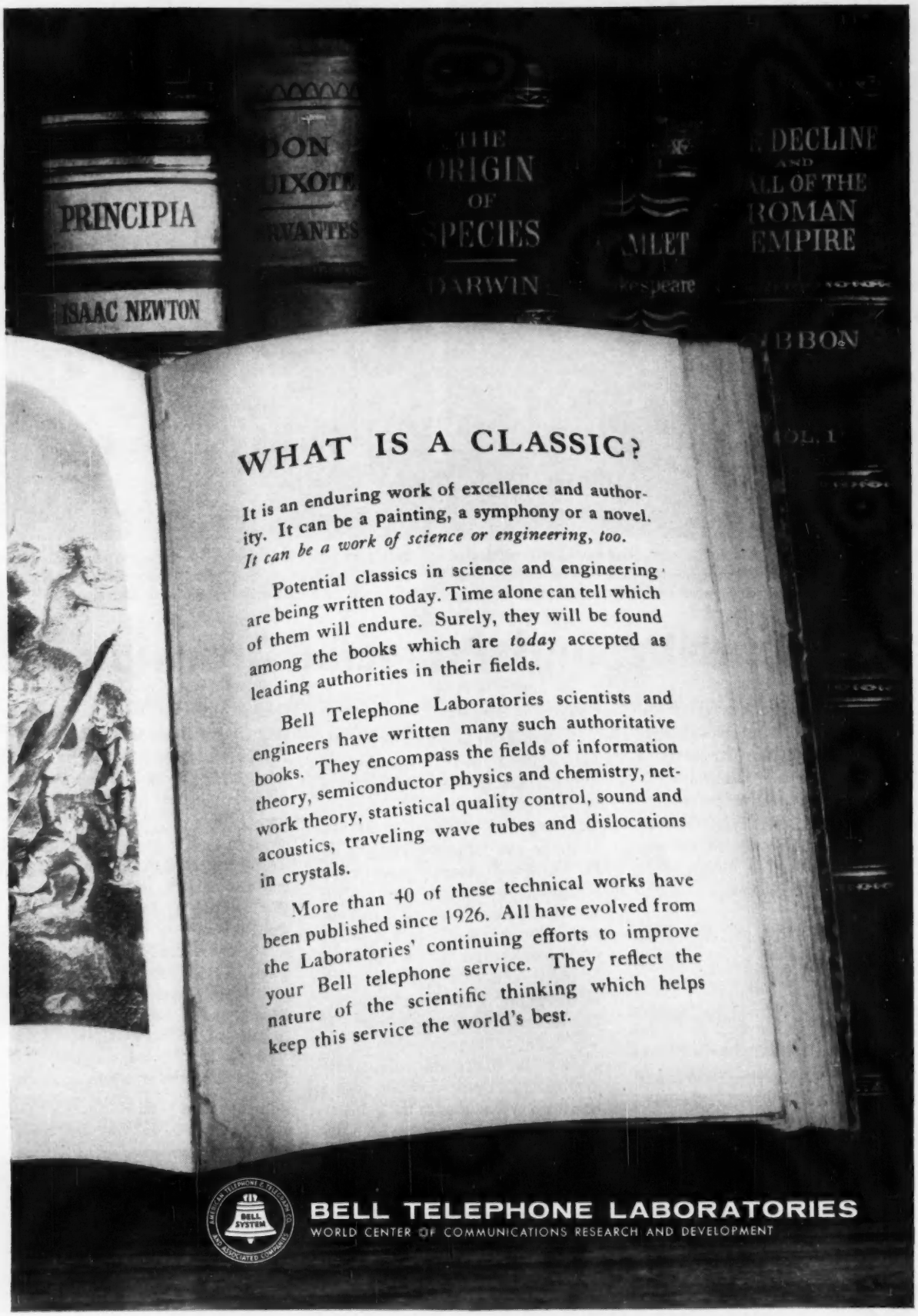
Ask your L-M Field Engineer for the complete story on why the RWP transformer can have increased secondary breaker settings without a new design or without new insulation. Or write me at Line Material Industries, Milwaukee 1, Wisconsin.

LINE MATERIAL Industries *Transformers*

McGRAW-EDISON COMPANY

DISTRIBUTION TRANSFORMERS • KYLE RECLOSERS AND OIL SWITCHES • FUSE CUTOUTS AND FUSE LINKS • LIGHTNING ARRESTERS
POWER SWITCHING EQUIPMENT • PACKAGED SUBSTATIONS • CAPACITORS • REGULATORS • OUTDOOR LIGHTING
LINE CONSTRUCTION MATERIALS • PORCELAIN INSULATORS • FIBRE PIPE AND CONDUIT

422



WHAT IS A CLASSIC?

It is an enduring work of excellence and authority. It can be a painting, a symphony or a novel. *It can be a work of science or engineering, too.*

Potential classics in science and engineering are being written today. Time alone can tell which of them will endure. Surely, they will be found among the books which are *today* accepted as leading authorities in their fields.

Bell Telephone Laboratories scientists and engineers have written many such authoritative books. They encompass the fields of information theory, semiconductor physics and chemistry, network theory, statistical quality control, sound and acoustics, traveling wave tubes and dislocations in crystals.

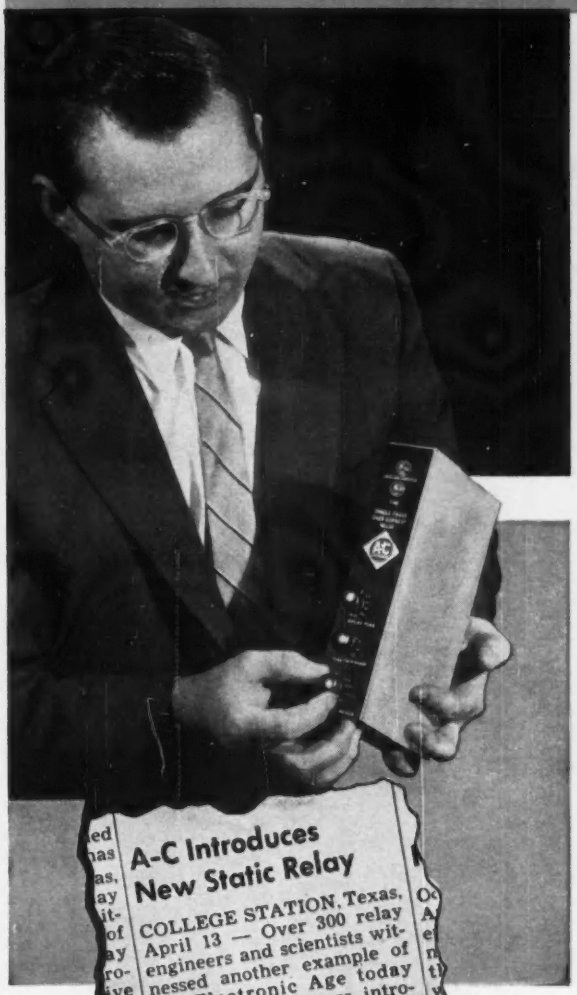
More than 40 of these technical works have been published since 1926. All have evolved from the Laboratories' continuing efforts to improve your Bell telephone service. They reflect the nature of the scientific thinking which helps keep this service the world's best.

BELL SYSTEM

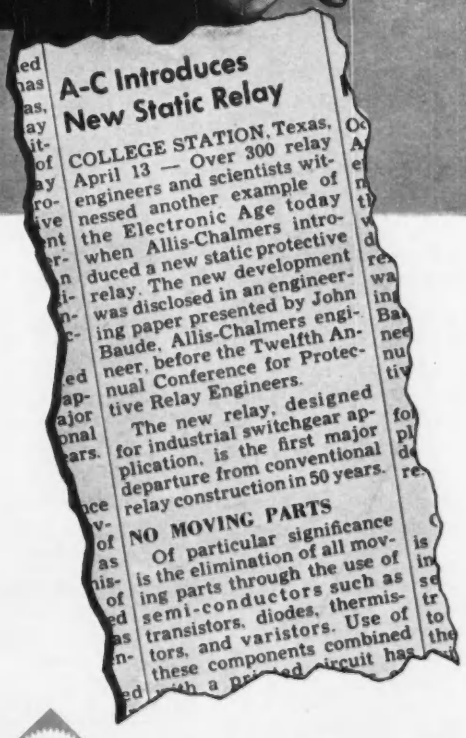
BELL TELEPHONE LABORATORIES

WORLD CENTER OF COMMUNICATIONS RESEARCH AND DEVELOPMENT

ALLIS-CHALMERS...Pacing Power Progress



Small size saves panel space.



A-C Introduces New Static Relay

COLLEGE STATION, Texas, April 13 — Over 300 relay engineers and scientists witnessed another example of the Electronic Age today when Allis-Chalmers introduced a new static protective relay. The new development was disclosed in an engineering paper presented by John Baude, Allis-Chalmers engineer, before the Twelfth Annual Conference for Protective Relay Engineers.

The new relay, designed for industrial switchgear application, is the first major departure from conventional relay construction in 50 years.

NO MOVING PARTS

Of particular significance is the elimination of all moving parts through the use of semi-conductors such as transistors, diodes, thermistors, and varistors. Use of these components combined

FIRST

completely static protective relay!

. . . available in Allis-Chalmers switchgear

This highly reliable *new* protective overcurrent relay has no moving parts . . . it's static, and it's only ⅓ the size of conventional relays.

Employing transistors, printed circuits, and other electronic components encased in epoxy-resin, A-C static relays are shock and moisture resistant They're unaffected by temperature changes, operate with low burden, and have instantaneous reset feature. Quick plug-in construction makes replacement easy.

Want more protective relay-equipped switchgear facts? Contact your nearby A-C office or Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

A-1157-E

ALLIS-CHALMERS

here's the inside story on Southern States cutouts and boric acid fuse links

While Southern States Distribution Cutouts are designed to function properly with other makes of fuse links, there is a measurable difference in performance when Southern States boric acid links are used—not only in our cutouts, but in other makes, too.

The cutaway view tells the inside story of why Southern States Cutouts and Fuse Links work together to provide the ultimate in fuse protection.

The auxiliary tube of the link is unusually long and sealed to the top ferrule. The fusible element is buried in boric acid powder.

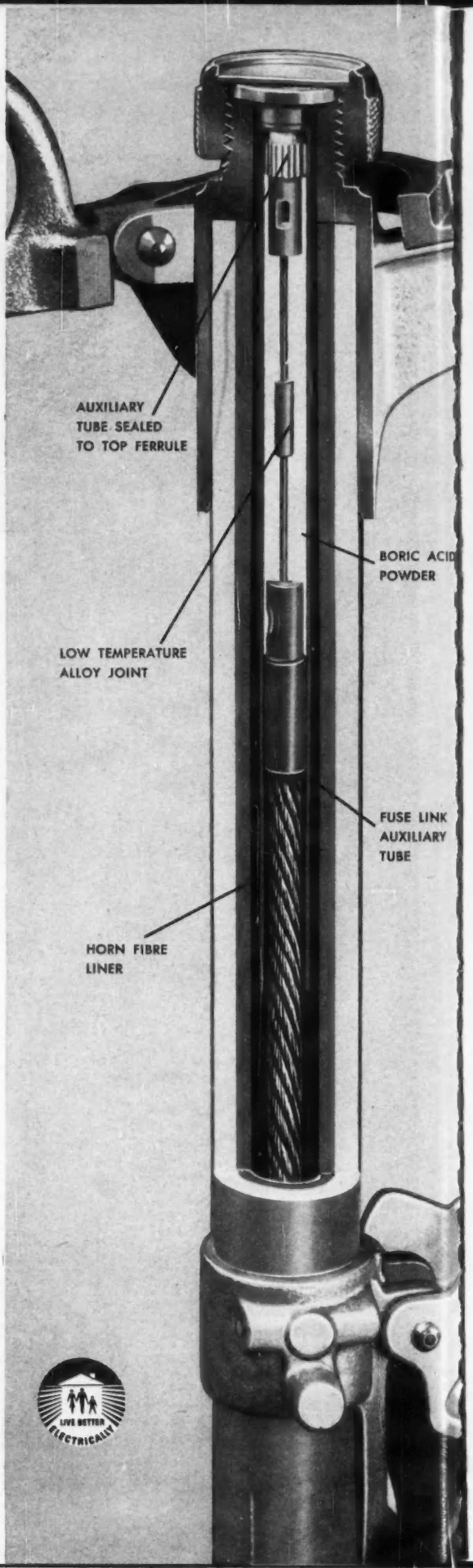
When a fault occurs, even one just sufficient to melt the fusible element, a lot of things happen fast: First, an arc is established when the element separates. The heat generated by the arc instantly converts the boric acid powder into water and then into a large volume of steam. This action performs a dual task. First, vaporization of the water and rapid expansion of gas cools the arc. Simultaneously the arc stream is purged of ionized gas by a fast-moving column of steam.

Circuit interruption is swift and sure.

At higher values of fault current, pressures generated destroy the auxiliary tube. When this happens the main tube takes over, normally clearing the fault in less than a cycle.

For the ultimate in fuse protection on low or high faults, use Southern States Cutouts and Fuse Links.

Get full information from your Southern States representative, or write for Bulletins 580C and 55PDL.

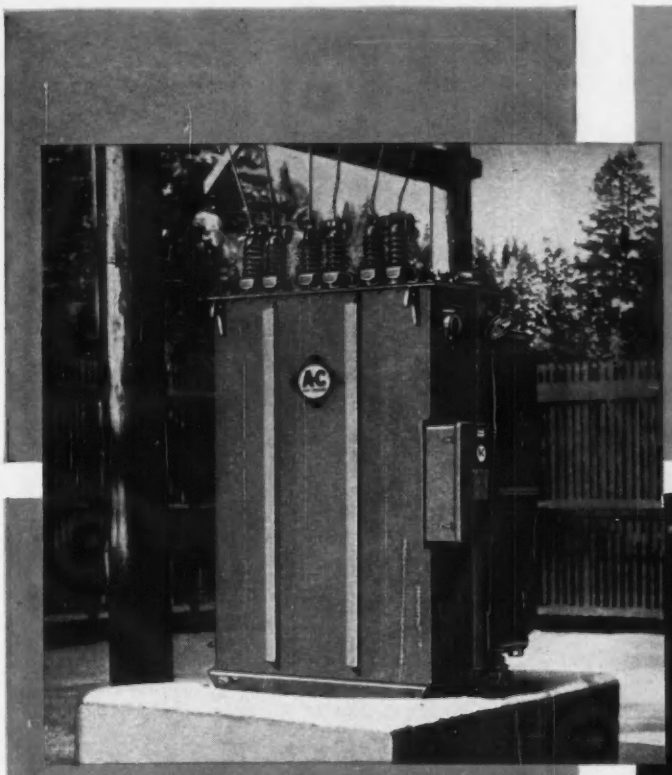

AUXILIARY TUBE SEALED TO TOP FERRULE
BORIC ACID POWDER
LOW TEMPERATURE ALLOY JOINT
FUSE LINK AUXILIARY TUBE
HORN FIBRE LINER

SOUTHERN STATES
EQUIPMENT CORP.
HAMPTON, GEORGIA

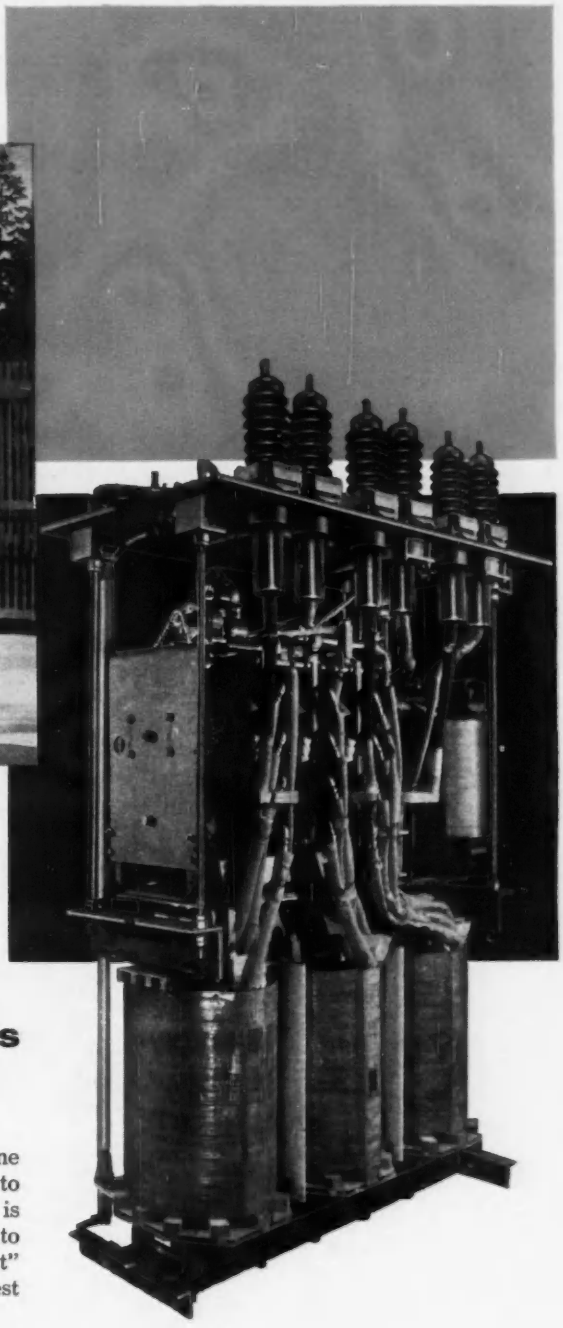
IN CANADA Dominion Cutout Co., Ltd., Toronto

LIVE BETTER ELECTRICALLY

ALLIS-CHALMERS... Pacing Power Progress



standardized components
and unit design



why Allis-Chalmers 3-phase regulators

PACK MORE VALUE

Mass manufacturing of standard components — that's one reason why Allis-Chalmers can put so much value into industry's lowest-priced 3-phase regulators. Another key is *unit construction*. Simplified subassemblies are joined into a complete unit. Suspended from the cover, this "lift-out" unit makes interior readily accessible, assures you the best in construction.

More A-C regulator values: *Caliband* control, "Quick-Break" tap-changing mechanism, unidirectional breather and *Vari-Amp* rating.

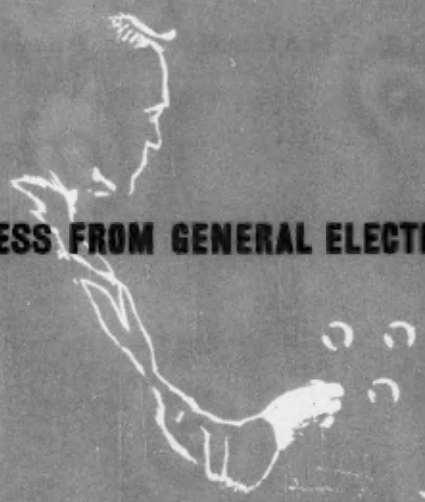
Originators of ⅝% step regulators

Regulator facts fast! Call, wire or write...

ALLIS-CHALMERS

Caliband and *Vari-Amp* are Allis-Chalmers trademarks.

A-1164E



COMPUTER PROGRESS FROM GENERAL ELECTRIC

Two More Users Agree:

THE GE 307 MINIATURIZED NETWORK ANALYZER PAYS FOR ITSELF SOLVING TRANSMISSION AND DISTRIBUTION PROBLEMS

Utah Power and Light Company engineers R. W. Moody (l.) and G. Wilkinson use the GE 307 Miniaturized AC Network Analyzer to solve a typical problem in transmission. "It saves many engineering man hours in delivering solutions to problems involving engineering alternatives."

Kansas Power and Light Company engineers A. A. Liepa and J. D. Wallace use the GE 307 Analyzer in system voltage study, only one of the many applications. The GE 307 Analyzer "eliminates laborious calculations...we just set up the problem and determine answers quickly, efficiently," says engineer A. A. Liepa.

Again, G-E custom computer design delivers! In this instance, speeding solutions *right now* to problems too large for hand calculation, too small for the expense of large network analyzer solution. The Miniaturized Analyzer proves quick solutions for the following everyday, but must-be-solved problems:

- Studying such system voltage conditions as regulator capacitor requirements and determining corrections.
- Checking loadings on lines and cables.
- Investigating adequacy of presently installed, or future circuit breakers.
- Analysis of transmission requirements to supply new loads.

Request brochure CPB-4B. Contact your nearest General Electric Apparatus Sales Division Office, or write to: Computer Department, General Electric Company, Deer Valley Park, Phoenix, Arizona, Room 5500.

Progress Is Our Most Important Product

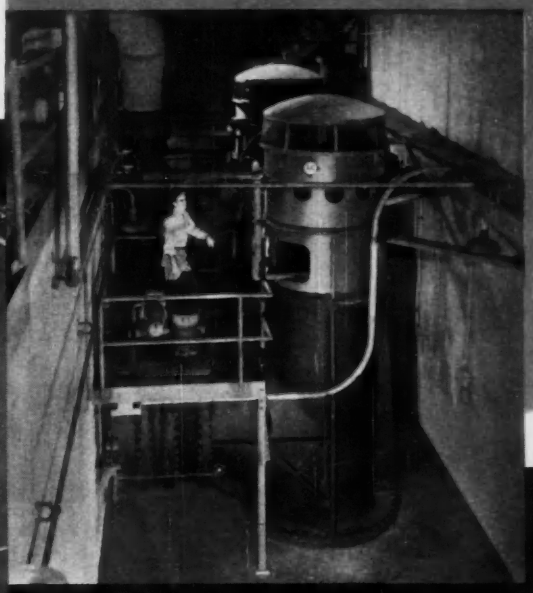
GENERAL ELECTRIC

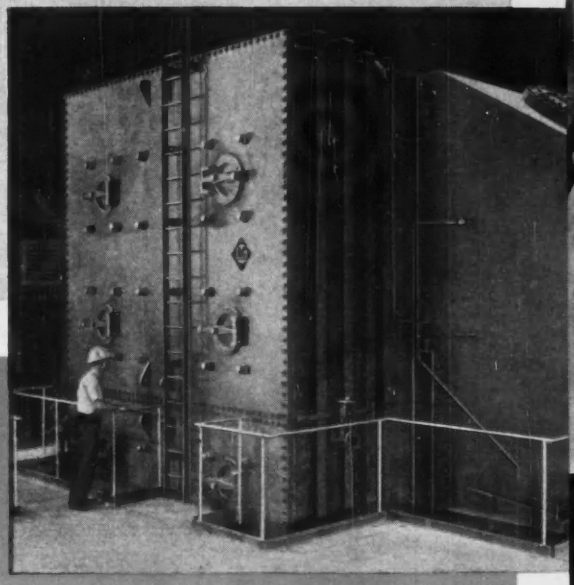
FOR FIGURES IN A HURRY—FIGURE ON A GE COMPUTER

CPA-22 (11-59)

ALLIS-CHALMERS... Pacing Power Progress

Planned-as-a-package auxiliary — two A-C vertical mixed-flow pumps serving a condenser at a midwestern power plant.





Planned-as-a-package condenser—a side inlet 130,000-sq-ft, two-pass surface condenser.

Complete CONDENSER auxiliary equipment planned as a package

. . . and mated to your project to gain peak system efficiency

Here's how A-C engineers maintain the higher degree of operating efficiency created by "guided-flow" condenser design. They select from a complete line of circulating and condensate pumps, motors, air ejectors and rotary vacuum pumps, then application-engineer these auxiliaries into an integral condenser package. All system components serve the condenser in achieving highest possible vacuum, maximum condensate temperature with a minimum of dissolved oxygen.

And in every size — from 100 to 200,000 sq ft and larger — you benefit from Allis-Chalmers pioneered *rectangular* condenser shape that makes possible a more compact, space-saving installation.

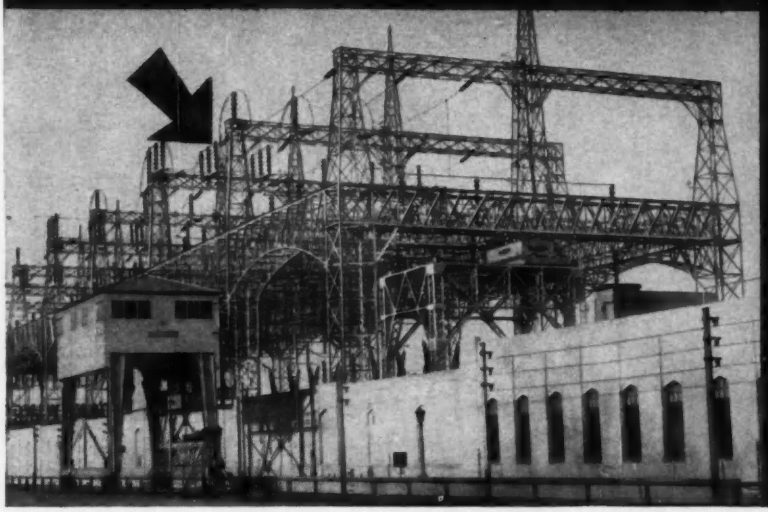
For complete condenser help — from design through erection — see your nearby A-C office or Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

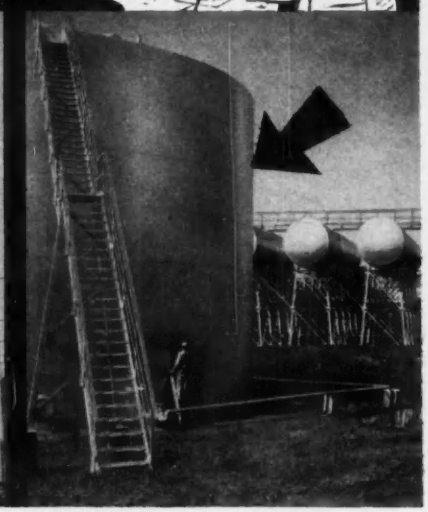
ALLIS-CHALMERS A-C A-1162-E

REVOLUTIONARY NEW PAINT

CUTS MAINTENANCE COSTS

30% AND MORE!





VITA-VAR'S STAINLESS STEEL PAINT

Life Expectancy 12 Years or More!

Smooth Surface Resists Dirt and Soot!

Easy to Apply! Cuts Painting Costs!

Finish Becomes Brighter and Lighter!

Non Corrosive! Contains Stainless Steel Flakes!

VITA-VAR STAINLESS STEEL PAINT #13448 – A product of Vita-Var's Research Laboratory which co-operated with a large power company in the pioneering of its development – represents a significant advance in the durability of maintenance paints for steel and aged galvanized iron exposed to corrosive atmospheres.

THIS PAINT which contains a mixture of stainless steel flake (18% Cr., 8% Ni) and non-metallic pigments has successfully passed 8 years of extensive laboratory and field tests in corrosive areas.

FIELD TESTS on transmission towers recently inspected revealed that the paint showed no failure and retained its original freshness which indicates that it will afford protection for at least 12 years and probably more.

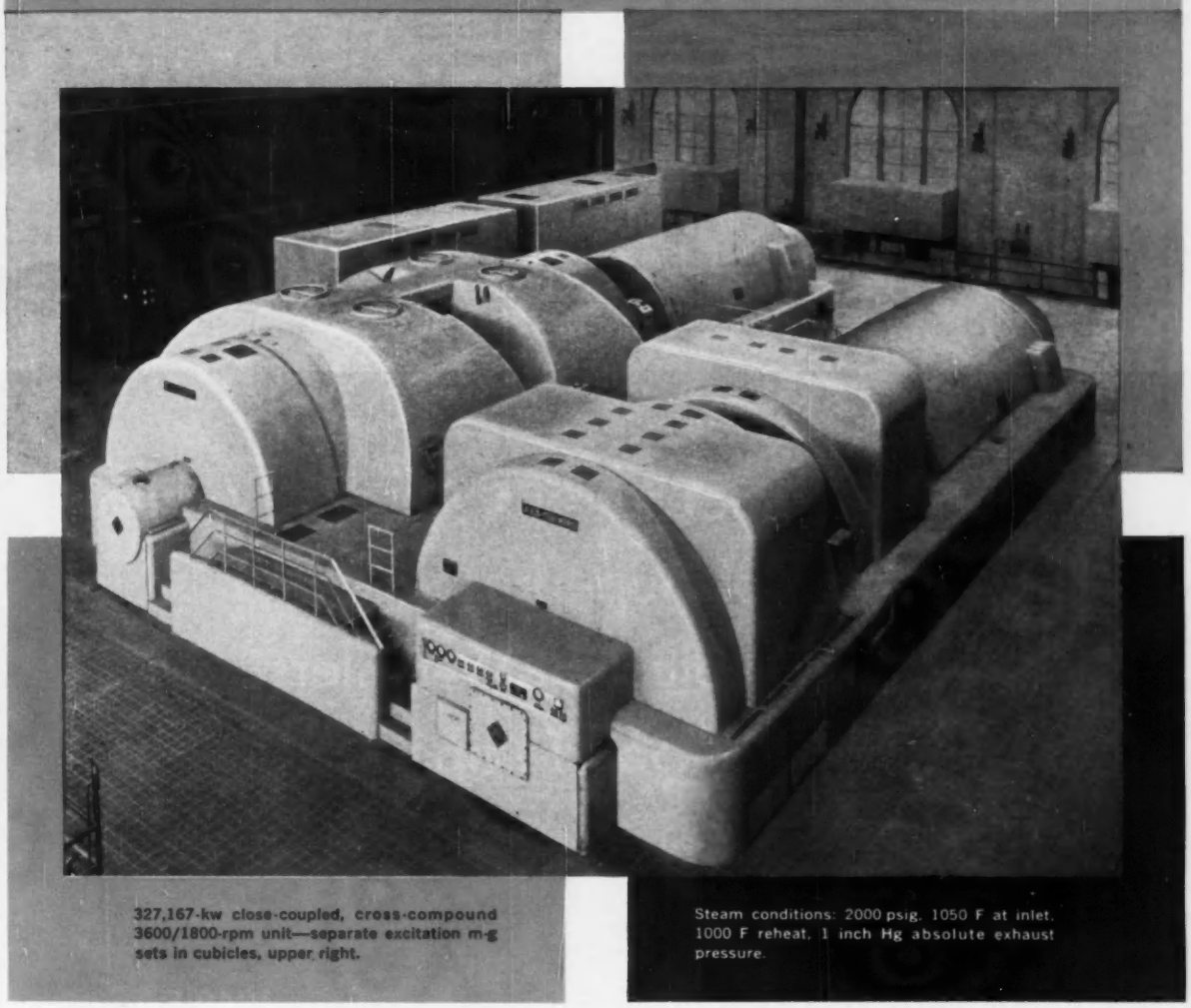
Investigate the superior advantages as compared to quality conventional paints! **LONG LASTING** due to protective qualities of stainless steel flake! **SMOOTH SURFACE** discourages dirt and soot deposits! **EASE OF APPLICATION** by brush, spray or roller coater reduces painting time! **MINIMUM CHALKING! METALLIC** appearance enhanced by aging, color becomes brighter and lighter! **LIFE EXPECTANCY** . . . 12 years or more!

For further information, write to:

VITA-VAR CORPORATION

NEWARK 2, N. J. **Paint Engineers Since 1888**

ALLIS-CHALMERS... Pacing Power Progress



327,167-kw close-coupled, cross-compound 3600/1800-rpm unit—separate excitation m-g sets in cubicles, upper right.

Steam conditions: 2000 psig, 1050 F at inlet, 1000 F reheat, 1 inch Hg absolute exhaust pressure.

Commonwealth Edison's new 327,167-kw Fisk 19 doubles station output

This steam turbine generator, the second of several such Allis-Chalmers units to go into service, is equipped with record 46-inch long exhaust blades. The unit's 200,000-sq-ft Allis-Chalmers condenser, too, is of world-record size.

Notable among today's generation achievements, Fisk 19 employs close-coupling with short crossunders, a ring-type nozzle chest, side-mounted turning gears, a double-flow intermediate pressure turbine and a fully supercharged 3600-rpm generator.

To learn more about these and other design features of Allis-Chalmers tandem and cross-compound units, see your nearby A-C office or write to Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS

A-1154-E

Gas Tempering: **Report No. 1**

Electric Utilities Find G
Safe Superheater T

Metal Temperatures Across Width of Superheaters of Typical B&W Boilers with Gas Tempering

BOILER No. 1

Average Metal Temperature	1040 F	
Deviation		±40F

BOILER No. 2

Average Metal Temperature	1035 F	
Deviation		±50F

BOILER No. 3

Average Metal Temperature	1125 F	
Deviation		±45F

Gas Tempering Assures Tube Temperatures

Longer Tube Life
Less Superheater Maintenance
Need For High Alloys Minimized

The ideal gas temperature to which superheater tubes should be exposed is the lowest temperature that will provide the required superheat and reheat with a reasonable amount of surface. If this temperature is exceeded in order to make a larger proportion of the total heat released in the furnace available for superheating and reheating, alloy requirements are increased and there is greater danger of superheater tube failure.

Now, the required heat can be delivered to the superheater *without exceeding desired metal temperatures* by the use of Gas Tempering.

Gas Tempering—is the reintroduction of cool flue gases near the furnace outlet to control the temperature of the furnace gases entering the superheater. It allows you to control furnace exit gas temperatures under all operating conditions.

Definitive Booklet: If you'd like to learn more about the economies and design flexibility available to you through Gas Tempering, write for Bulletin G-96. Address: The Babcock & Wilcox Company, Boiler Division, Barberton, Ohio.

Major Advantages of B&W Gas Tempering

. . . It cuts overall plant costs because the smaller size unit requires a smaller building per kw, a lighter foundation, less structural steel and shorter steam leads.

. . . It enables you to utilize the most economical available fuels. It permits the burning of a variety of coals without slagging, minimizes external corrosion of superheater tubes, and assures safe metal temperature, thus prolonging tube life, regardless of the fuel fired.

. . . It provides safe superheater tube temperature by positive gas temperature control; it protects superheater during startup and under all operating conditions.

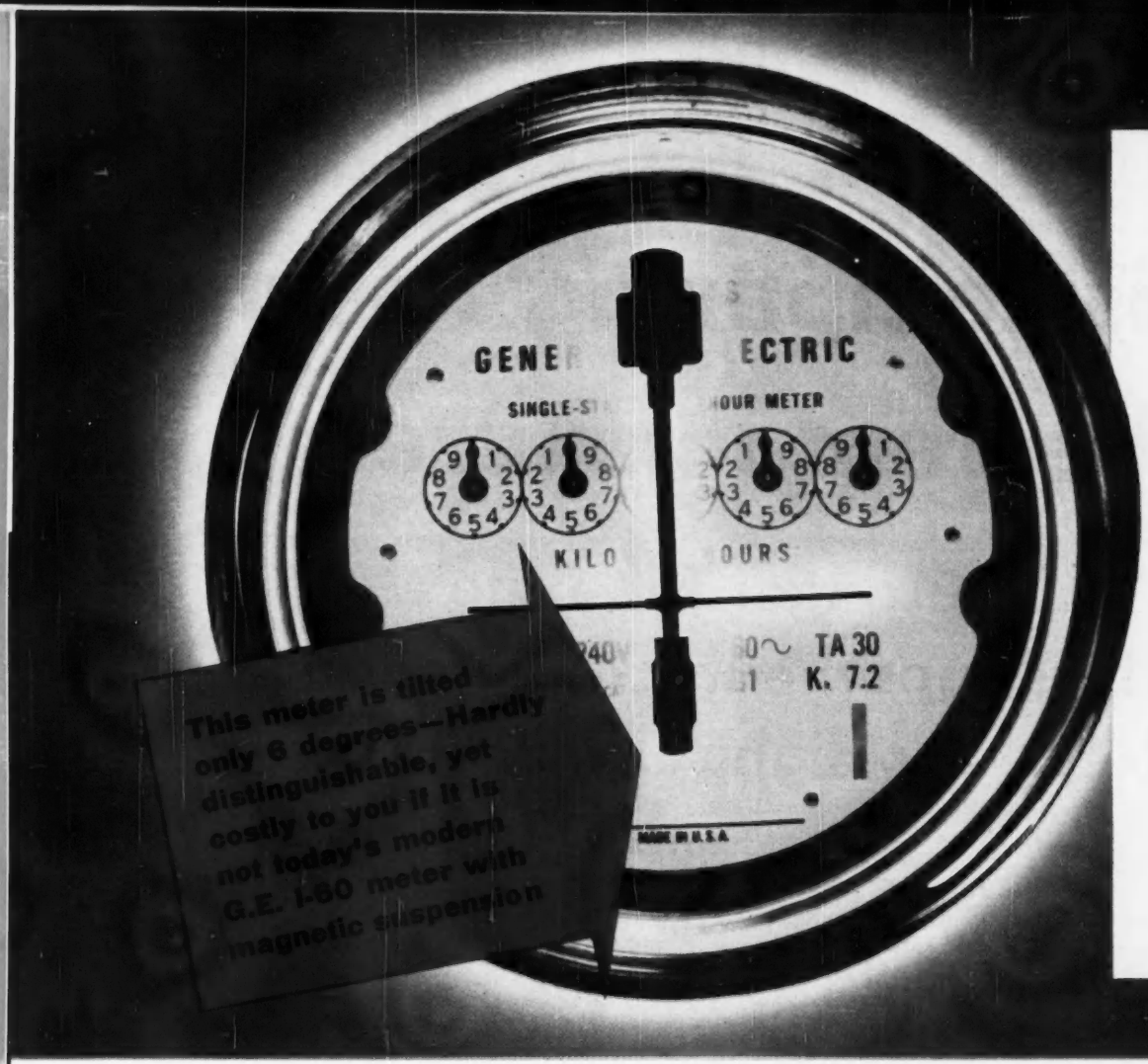
. . . It makes it safer to design for economies offered by operation at steam temperatures of 1050 F and above.

B&W

THE BABCOCK & WILCOX COMPANY

BOILER DIVISION

G-936



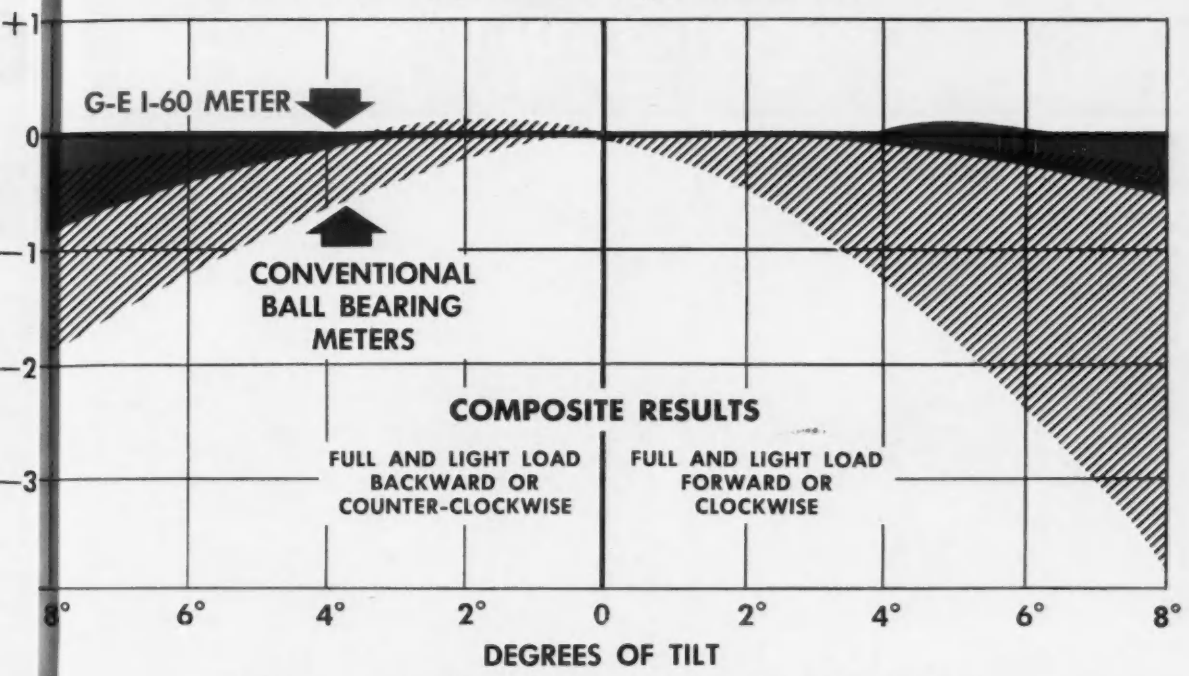
No need for lost revenue from tilted meters..

Untold numbers of watthour meters in service today are operating at a tilt from true vertical. This condition may be due to improper mounting, to accident, molesting of the installation, or uneven settling of the house, pole, or building on which the meter is installed.

Regardless of how "tilt" occurs, however, the fact is that, with old-style, ball-bearing assemblies, *tilted meters run slow, thereby causing revenue losses.* Actually, a single ball-bearing meter—tilted *just six degrees* from vertical—can cost a utility as much as $50.00 in 30 years of operation. Multiply this figure by the number of meters *you* have in service . . . then read the next page for a solution to this problem, which is costing you and other electric utilities hundreds of thousands of dollars in lost revenue every year.

AVERAGE TILT ERROR

3W, 240V, 30-amp, Class 200 Single-stator Meter



NOTE: *The gray area contains the average results of three manufacturers' conventional class 200 ball-bearing meters. The red area contains the average results of General Electric's Class 200 I-60 meters with magnetic suspension.*

rs...When it's so easy to overcome the problem

Because the disk and shaft in General Electric watthour meters are suspended *magnetically*, G-E meters (single- *and* polyphase) are virtually unaffected by tilt-caused error —error which *slows down* ordinary ball-and-jewel meters. (The relative spans of calibration change on the above chart show that ball-bearing meters average as much as 2 to 3½% slow at only 8° of "Tilt".) Unique, "free-floating" G-E magnetic suspension can substantially reduce that loss figure you calculated on the opposite page.

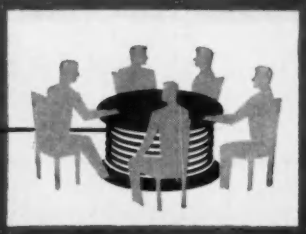
For more information, contact your G-E apparatus salesman. Or, write for Bulletin GEA-6683, General Electric Company, Schenectady 5, N. Y.

628-31

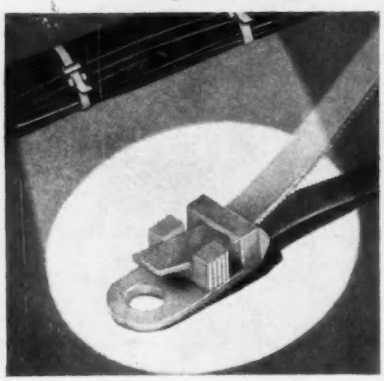
GENERAL ELECTRIC

WIRE AND CABLE ROUND TABLE

DU PONT



New clamps and ties of ZYTEL® have many advantages



These new "Lok-Strap" cable clamps and ties molded of Du Pont ZYTEL nylon resin offer advantages for either point-to-point wiring or pre-tied harness assemblies.

Adjustable in size, one "Lok-Strap" can replace a complete range of ordinary cable clamps. Because of the great strength of ZYTEL, these new clamps can withstand an unlocking force of 80 lbs., yet a few ounces of finger-tip pressure in the right place will release them. Also, there's no need to unscrew clamps for insertion or removal of wires. When harness must be disassembled, "Lok-Straps" are not cut off and destroyed. They can be opened and closed repeatedly, thus reducing revision and tracing costs considerably. And temperature is no problem: "Lok-Straps" have a service temperature range of –65°F. to 300°F.

"Lok-Straps" are molded of Du Pont ZYTEL by the Panduit Corporation, Midlothian, Ill.

Du Pont does not manufacture wire and cable, but supplies thermoplastic resins for insulation and jacketing.

POLYCHEMICALS DEPARTMENT

Triplex jacketed with ALATHON® overcomes soda-ash contamination problem for LP&L

In many of its triplex installations in West Monroe, La., the Louisiana Power & Light Company is faced with the problem of soda-ash contamination from nearby industrial plants. This contamination is strong enough to damage ordinary conductor protective coverings.

In answer to this problem, the Southern Electrical Company of Chattanooga recommended its corrosion-resistant "Compresto"* cable, jacketed with Du Pont ALATHON polyethylene resin.

Besides overcoming the contamination problem, the tough jacket of ALATHON offers extra resistance to weather and abrasion from trees. In all, Mr. Hugh Balfour, Northern Division Engineer for LP&L summarized his company's opinion of "Compresto" by saying, "We have been very satisfied since switching to 'Compresto' cable jacketed with ALATHON. We recommend its use to other power suppliers faced with difficult environmental problems."

For information on how ALATHON can solve your problems, write your wire and cable manufacturer, or E. I. du Pont de Nemours Co. (Inc.), Department M-1130, Room 2507A, Nemours Building, Wilmington 98, Delaware.

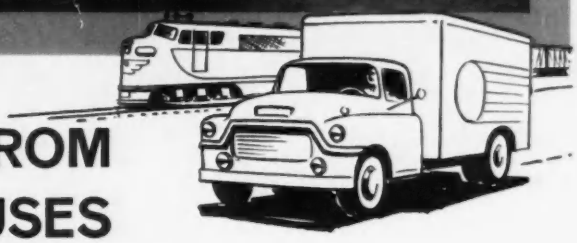
*Registered TM of Southern Electrical Co.

DU PONT
REG. U.S. PAT. OFF.

Better Things for Better Living . . . *through Chemistry*

ALATHON® POLYETHYLENE RESINS | **RULAN®** FLAME-RETARDANT PLASTICS | **ZYTEL®** NYLON RESINS

Specify Joslyn Anchoring Materials



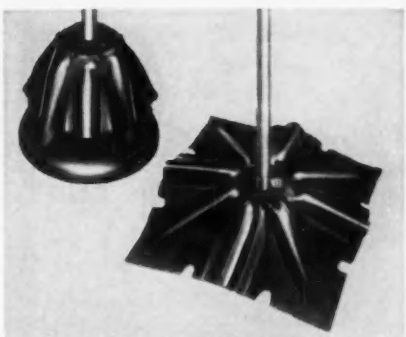
PROMPT DELIVERY FROM 27 JOSLYN WAREHOUSES ALL OVER THE COUNTRY

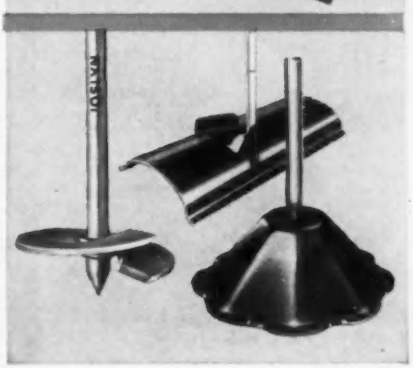
- **Expanding Anchors**
- **Screw Anchors**
- **Cone Anchors**
- **Plate Anchors**
- **Rock Anchors**
- **Anchor Rods**
- **Installing Tools**

Joslyn's Complete Line of all types and sizes of Anchors, Anchor Rods, and Anchor Installing Tools are as close to you as your nearest Joslyn Warehouse.

Handy packaging of 8-Way Expanding Anchors in color-coded cartons simplifies identification and stacking.

For details, ask for Bulletin J2-112
For prompt shipment, just call your Joslyn Representative or Sales Office.





LIVE BETTER ELECTRICALLY

paralleling electrical progress for 56 years!

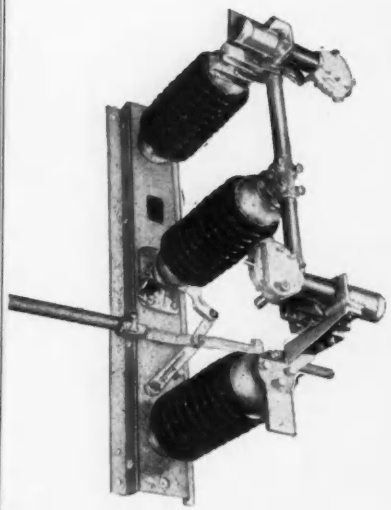
JOSLYN COMPLETE POLE LINE EQUIPMENT ®

JOSLYN MFG. AND SUPPLY CO.

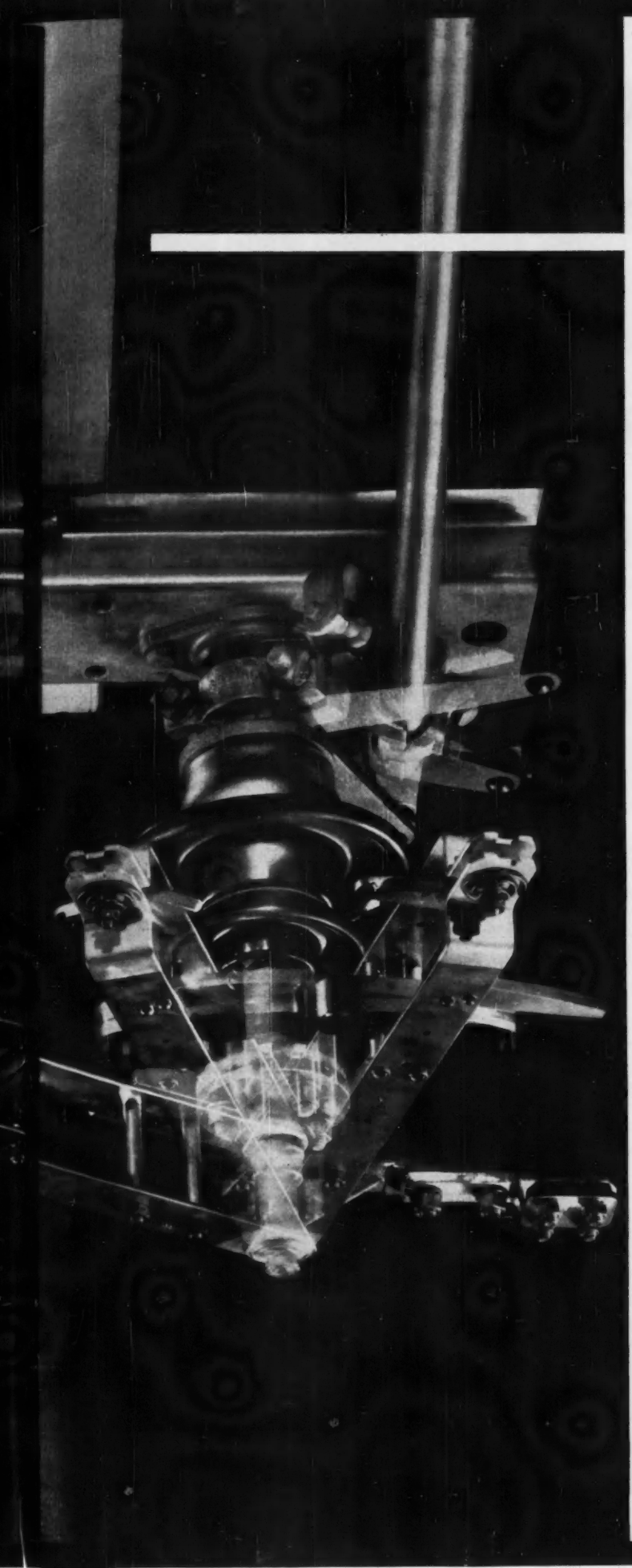
155 North Wacker Drive • Chicago 6, Illinois

SPLIT THE LOAD

(OR EVEN DUMP IT)



Double-Break Style, 34.5 kv rating (above) and Side-Break Style, 14.4 kv rating (right)



with S&C Load Interrupters that cost no more than disconnects

Now from S&C you can get load interrupters at the same price as disconnects. This means that you can handle any kind of line switching in the simplest way at the lowest possible cost.

Here are the devices that do it:

1. The Side-Break Alduti Load Interrupter at 7.2 kv and 14.4 kv, and
2. The Double-Break Alduti Load Interrupter at 23 kv and 34.5 kv.

Both give you load dumping* (full 600-ampere arc-free load switching at full line voltage) along with loop sectionalizing (switching currents in parallel or loop circuits) and line dropping (switching line charging currents).

Since these switching duties at today's voltages and loads can't be handled by disconnects, why not compare the cost of S&C Load Interrupters with disconnects. You'll find there's no premium price for premium performance.

Here are some of the other advantages of S&C Load Interrupters:

- 600-amp load switching without line or feeder breaker openings
- a maintenance-free interrupting device
- no external arc
- can be mounted in any position . . . vertical, upright or inverted.

For more information, please contact S&C Electric Company, 4421 Ravenswood Avenue, Chicago 40, Ill.

* Important because: (1) Emergency situations (wires down, etc.) demand quick action, hence dumping the load. There is no time to set up communications for complicated breaker and switch sequencing. And (2) there's always the possibility of an operator error or misunderstanding, with the result that a loaded circuit may be dumped inadvertently.

S&C ELECTRIC COMPANY

S&C

PERFOR

Number 1 reason why the best bargains i

IN FLUORESCENT LAMPS, buying on price alone is no bargain at all. (Because the price of the lamps averages only 10% of the operating costs of light.) The other 90% goes for electricity and maintenance. Conclusion? The *best* lamp bargain works your customers' lighting dollar the hardest, gives the most *light* for their money.

How do G-E Fluorescents stack up? Take the popular 4-foot, 40-watt. The new General Electric PREMIUM 3 Lamp, announced in 1959, delivers more light per watt than any previous 4-foot fluorescents. As for maintenance—out of every 1,000 G-E 40-watt fluorescents you sell today, on the average 999 have no defect which can keep them from working—and 990 will still be burning late in 1961! Practically maintenance-free performance like this makes G-E 40-watt, slimline, high output and the exclusive Power Groove Lamps your customers' best bargains in fluorescent light.

IN MERCURY LAMPS, you have the source which can give customers the lowest cost of light of any type of lamp commercially available. Lower than filament—often lower, even, than fluorescent. *And General Electric Mercury Lamps, at any given time in their life, will outperform any other brand the same age* . . . and are built to last as long or longer!

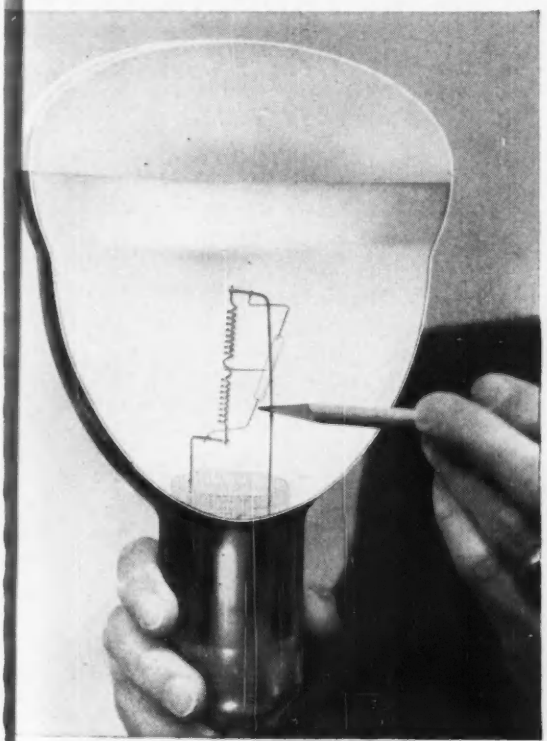
How? In many ways. To name a few—General Electric's dramatic new Bonus Line electrodes, better arc-tube design, and fewer parts to intercept light. And a new 1959 line of six G-E Bonus Line 400-watt Mercury Lamps are the *biggest* bargain in mercury light.

IN FILAMENT LAMPS there are some important differences between brands—some of which are detectable even *before* the lamp goes in a socket. Like the new 1959 smaller, brighter, 100-watt lamp bulb that's small as a 60-watter but delivers more initial light than two 60's. Or the new 1959 G-E Quartzline lamps that are pencil-thin but pack up to 1500 watts.

Or like the new 1959 RB-52 Bonus Line 1000-watt reflector lamp shown at right. Special bulge shape distributes heat, so a less-costly, regular glass is used—with savings passed on to your customers. And look! It uses General Electric's stand-up filament that delivers more light than ordinary "draped" type, has more expensive *silver* reflector instead of aluminum. It gives 20-30% extra light on the work plane. Big things are happening in G-E Filament lamps—all pointing to a bigger bargain in filament light for your G-E Lamp customers.

MANCE

s in light are General Electric Lamps



IF YOU RECOMMEND REPLACEMENT LAMPS, then lamp selection is relatively easy. For new installations, however, the job is not often that simple. For this reason General Electric's corps of engineers, technicians and specialists are as near as your phone—to help you help your customers pick the right General Electric Lamp that'll give them the best bargain in light. They'll even aid in recommending the lamp type, size and "color" best for each customer's individual lighting conditions.

FREE FROM G. E. Right now... today you can get a startling new 20-page picture paper packed with factual information on lamps and lighting that can help your customers save big money. For your free copy just send your name and address to General Electric Co., Large Lamp Dept. C-931, Nela Park, Cleveland 12, Ohio. Be sure to ask for "FACTS OF LIGHT". See your G-E Large Lamp Representative for larger quantities.

Progress Is Our Most Important Product

GENERAL ELECTRIC

Distribution engineer says:

"Reynolds 5005* proves ideal for reconductoring– easy to string–easy to splice"

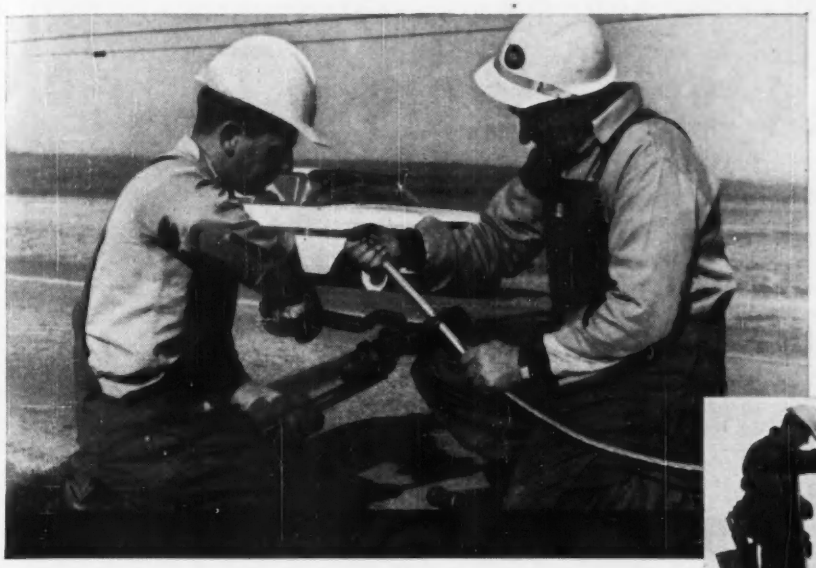
"Installation costs were reduced and we expect lower maintenance cost on this job," adds the engineer of a Midwest utility who recently designed Reynolds new all-aluminum conductor into 12.5 KV distribution line.

Many major utilities are finding 5005 an excellent conductor buy from four important cost standpoints: (1) *Lower original cost.* 5005 is lower in price than copper or equivalent ACSR. (2) *Lower installation costs.* 5005 is easy to string, easy to handle. And because it has no steel core, it's simple to splice. (3) *Lower maintenance costs.* 5005 is a high strength alloy—stronger than EC—resists rough treatment and abrasion. 5005 has no steel core which means no galvanic corrosion, and because this utility practices "hot line" maintenance on their distribution lines, the elimination of the steel core greatly simplifies splicing operations. (4) *Better scrap value.* If and when this line is scrapped, the all-aluminum 5005 will bring higher value.

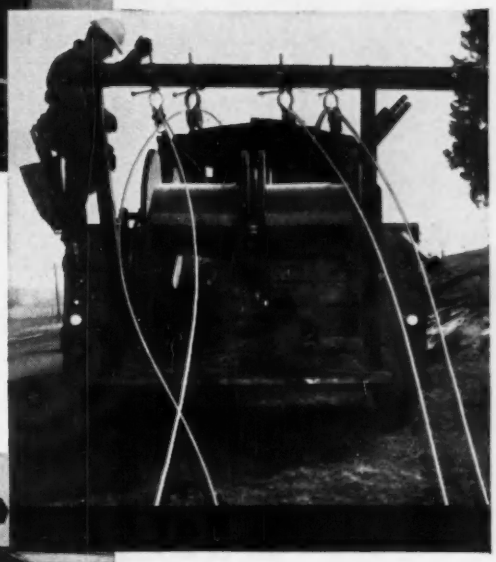
Reynolds Cables made of 5005 aluminum alloy have properties and sag characteristics that make them especially attractive. The new conductor has met a specific need for relatively short span construction . . . it is also ideal as the neutral messenger in triplex and has many interesting possibilities in the larger sizes. Investigate the potentials 5005 may have for you. Complete electrical, physical and mechanical data is available. You may obtain it by contacting your Reynolds branch office, your Reynolds Electrical Distributor, or by writing *Reynolds Metals Company, P.O. Box 2346-EL, Richmond 18, Va.*

* Minimum guaranteed conductivity for Reynolds 5005 conductor has recently been increased from 52.14% to 53.5%. You get more conductance at a lower cost than with any other standard conductor of comparable size and strength . . . lower power losses . . . improved voltage regulation . . . increased current carrying capacity.

The Finest Products Made with Aluminum are made with REYNOLDS ALUMINUM



"Splicing is simple with 5005 —no steel core—we use standard connectors and standard tools," says the line foreman of this installation.



Reynolds 5005 being reeled off for stringing. Linemen like the way the all-aluminum conductor handles . . . it is light in weight and being a high strength alloy it resists rough treatment and abrasion.

Reynolds engineering on the job. Reynolds Electrical Conductors Director, Harold Adams, (on truck) inspects the 5005 cable and the reel setup with utility and contractor personnel.

REYNOLDS ALUMINUM

Watch Reynolds TV shows—"ALL STAR GOLF", "BOURBON STREET BEAT" and "ADVENTURES IN PARADISE"—ABC-TV

IMPORTANT NEWS ABOUT COST-SAVING IN INVENTORIES OF REPLACEMENT BUSHINGS

. . . . . **ONE**

BUSHING . . . .

PLUS ONE

SPARE TERMINAL . . . .

will provide complete interchangeability . . . a 400-ampere draw-lead transformer bushing . . . a fixed-conductor 1,200-ampere bushing for circuit breaker or transformer use . . . for each operating voltage 69 kv and below.

At 92 to 161 kv, one POC-A unit (with extra terminal and circuit breaker ring) provides for 800-ampere draw-lead service, 1,200 or 1,600-ampere fixed-stud transformer installation or 1,600-ampere circuit breaker use.

At 180 and 196 kv, with only one spare terminal, the POC-A bushing adapts for 800-ampere draw-lead service, 1,200 or 1,600-ampere fixed-stud transformer duty, or 1,600-ampere circuit breaker use.

You can save on storage space, too. Lapp POC-A bushings are totally-enclosed, moisture-proof, with porcelain insulation. They may be stored indoors or outdoors indefinitely with complete safety.

at every voltage rating, 15 kv through 196 kv, there's a single all-purpose Lapp POC-A* Bushing adaptable to transformer or circuit breaker use

Lapp

* Lapp POC-A means "Paper-Oil-Condenser-Adaptable." The introduction by Lapp of totally-enclosed paper-oil bushings brought the reliability and operating security of this bushing construction to equipment and systems at voltage ratings from 15 kv up.

Now the POC design is modified to provide *adaptability*. At each voltage rating, the basic bushing has a hollow thick-wall conductor; interchangeable terminals provide for draw-lead *or* fixed-conductor service for transformer or circuit breaker use.

The new Lapp POC-A bushings conform to ASA standards (C76.1a-1958), and meet ASA dimensional requirements for several bushings in each voltage class. Also, flange adapters are available to provide for replacement of many pre-ASA bushings. Let us help you schedule a replacement bushing program that will greatly reduce your maintenance inventory.

Lapp Insulator Co., Inc., Le Roy, N. Y.

Look at the record

BROWN BOVERI

Year after year BROWN BOVERI has opened new vistas in extra-high voltage equipment and applications. Today BROWN BOVERI can point to 2,450,000 KVA in EHV transformer capacity delivered or on order. More than 133 air-blast circuit breakers rated 300 KV and above have been in successful operation for years both in North America and Europe.

A record of world-wide confidence in BROWN BOVERI EHV transformers and air-blast circuit breakers has been established through actual use and top performance. Maximum design voltage of most of this transmission equipment is 460 KV. Pioneering research and development of transformers and air-blast breakers rated up to 650 KV is in progress at BROWN BOVERI.

In your system planning, it may pay you to consider BROWN BOVERI'S unmatched background in the field of extra high voltage.

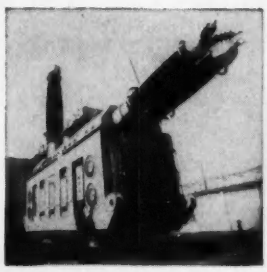
The complete record is yours for the asking.

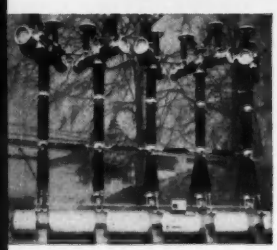
EHV TRANSFORMERS

Client and Shipping Date	KVA and Voltage Rating
Krangede AB Sweden 1956	two banks 130 MVA each, 13.8/400 kV step-up generator transformers
Kraftwerke Hinterrhein Switzerland 1957	two banks 400/280/187 MVA 420/201/10 kV *regulating* auto-transformers
RWE Germany 1958	one bank 660 MVA, 400/230/30 kV *regulating* auto-transformers
EDF France 1958	one bank 300 MVA, 380/230/10 kV
Imatran Voima Oy Helsinki, Finland 1960	four single-phase three-winding auto-transformers, three-phase bank rating 420/420/55 MVA, 380/238/20 kV

EHV AIRBLAST CIRCUIT BREAKERS

Client and Date of Order	Quantity	MVA & Voltage Rating	
KVS Sweden 1951	10	10000	400 kV
Kamijoki Finland 1955	2	10000	380 kV
Quebec Hydro 1954	23	10000	300 kV
Imatran Voima Oy Finland 1956	2	10000	380 kV
Quebec Hydro 1956	39	10000	300 kV
Imatran Voima Oy Finland 1957	5	10000	300 kV
Imatran Voima Oy Finland 1957	1	15000	400 kV
American Electric Corp. 1957	2	25000	345 kV
RWE Germany 1957	2	15000	400 kV
Aluminium Co. Canada 1957	4	15000	300 kV
Krangede AB Sweden 1957	2	15000	400 kV
Aluminium Co. Canada 1957	5	10000	345 kV
Aluminium Co. Canada 1957	4	10000	345 kV
Aluminium Co. Canada 1957	5	10000	345 kV
Motor Columbus Switzerland 1957	2	15000	400 kV
Imatran Voima Oy Finland 1957	3	15000	400 kV
KW Vorderrhein Switzerland 1958	6	15000	400 kV
Kemiyoky Oy Finland 1958	1	15000	400 kV
Electricity Supply Commission South Africa 1959	16	15000	275 kV





BROWN BOVERI CORPORATION

19 Rector Street, New York 6, N. Y.

Turbine in supercritical-pressure steam system uses

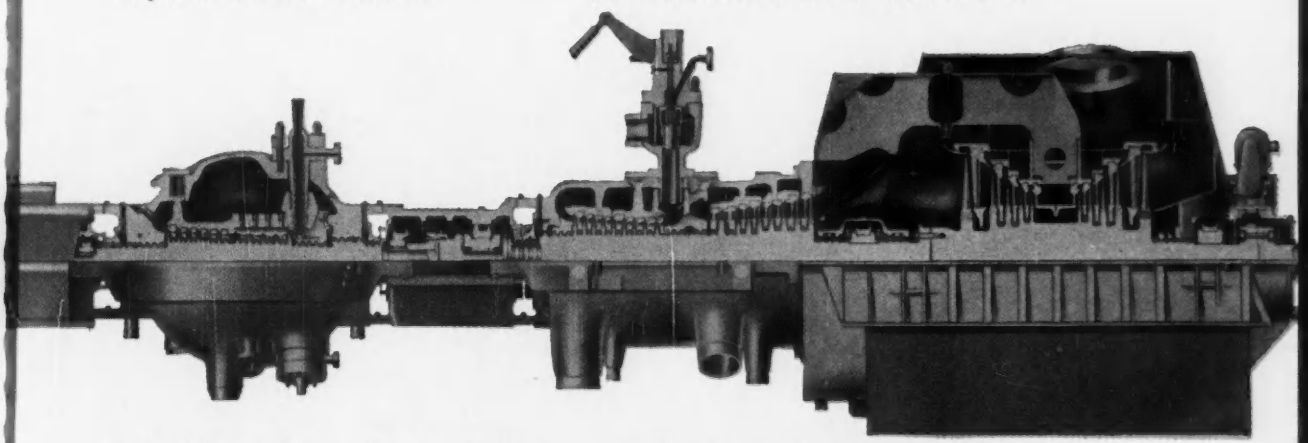
Nonpareil TURBINE OIL

. . . and
American Gas & Electric Power
receives
life-of-turbine guarantee for the oil

A General Electric turbine, for which the main steam pressure is 4,500 psi and the temperature is 1,150°F. has now been in service for more than a year. The performance of this developmental turbine, its associated steam generator and other equipment, indicates that this plant will set the pattern for steam power plants for the future. It is appropriate that the turbine oil is one that has been proved in more than 30 years of service—NONPAREIL.

To achieve new records in efficiency of operation and to accomplish even more efficient generation of electric power, American Electric Power engineering management had to be *sure* of every item of material used in the installation. NONPAREIL Turbine Oil was tested and found fully capable of providing the superior lubrication required by this history-making unit.

Over 1,000 turbines are in service using NONPAREIL Turbine Oil. To the owners of



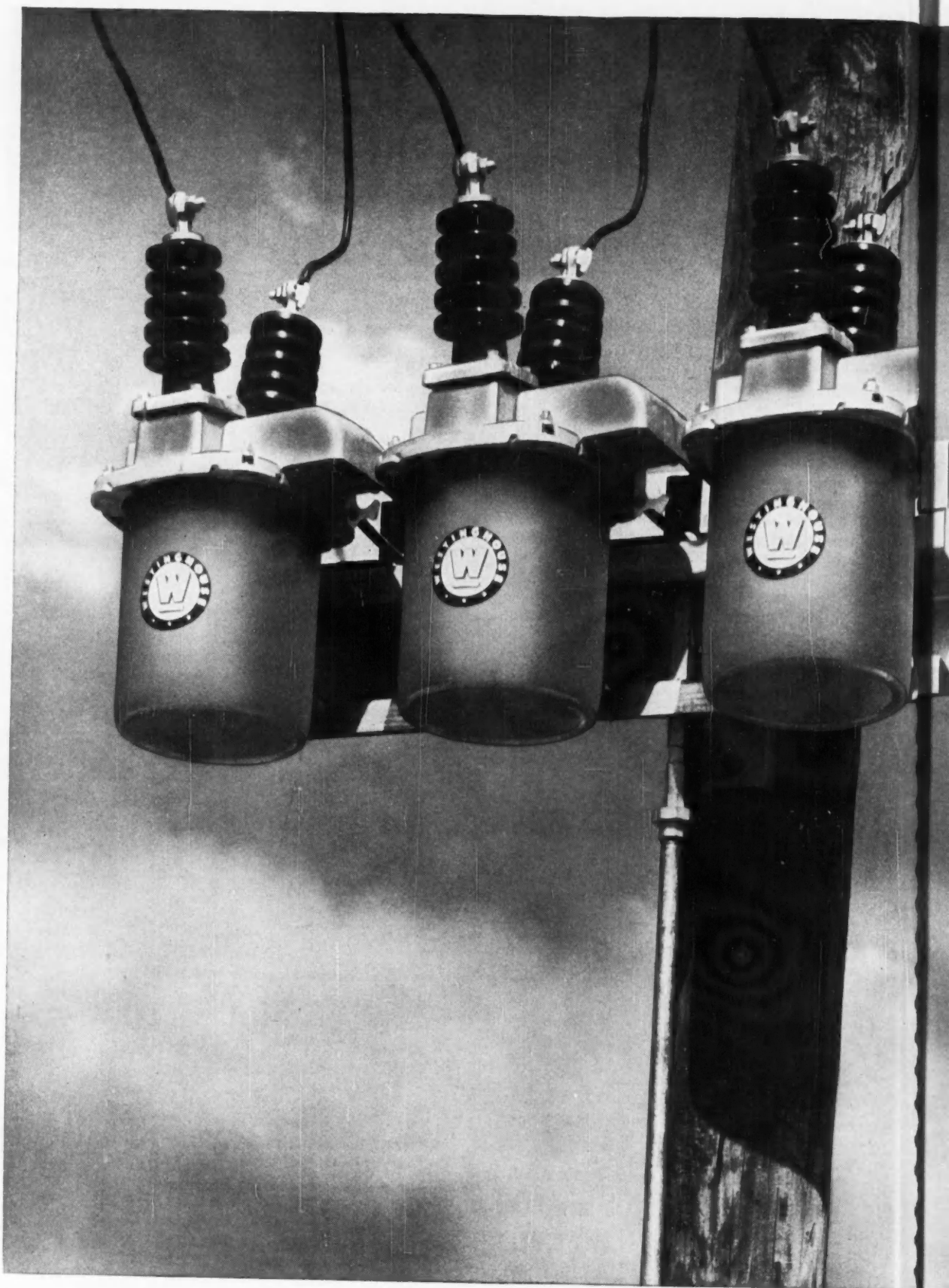
each of these turbines, a guarantee has been issued, which certifies that *for the life of the turbine* the oil will never exceed an acidity level of 0.15 mg. KOH/g. Most often it is in the order of 0.03 to 0.06 mg. KOH/g.

An industrial lubrication specialist in the Standard Oil office near you, in any of the 15 Midwest or Rocky Mountain states, will be glad to give you additional data on NONPAREIL Turbine Oil. Call him. Or write **Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.**

Quick facts about
Nonpareil Turbine Oil

- Will not permit formation of harmful acids
- Will not permit formation of sludge or oil varnish
- Will maintain good demulsibility or water separating characteristics
- Has high resistance to foaming
- Contains adequate rust inhibitor

You expect more from STANDARD and get it!

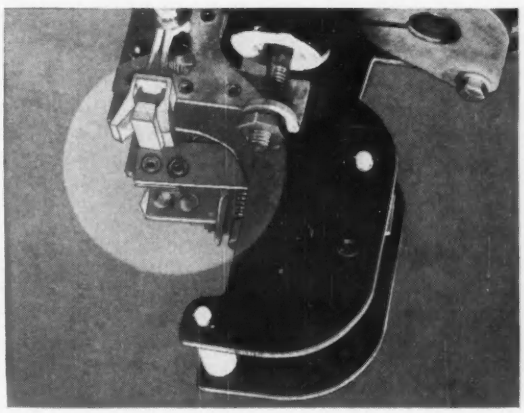


NEW WESTINGHOUSE CSL OIL SWITCH GIVES LONGER SERVICE LIFE, LOWER MAINTENANCE

The new 200-amp, 15-kv CSL embodies design advances which make it your best switching buy for pole-mounted capacitors, sports field lighting, street lighting, and sectionalizing applications. Improved thermal capacity, larger bushings with greater creep distances, increased dielectric strength of operating coils, finger-type contacts, and higher ratings are but a few of the CSL's outstanding features.

Faster closing contacts with positive wiping action

Initial contact is always made on the tips of the contacts, which are wiped clean as the closing cycle is completed, minimizing resistance even after repeated operations at maximum ratings. When the CSL is in the fully closed position, the current path is through surfaces of the contacts that are never subjected to strike. Contact speed has been increased to a minimum of 10 feet per second, helping to avoid reignitions and restrikes during capacitor switching. Moving and stationary control contacts are supported by a common member (see photo below), reducing alignment adjustments.



Solenoid-operated switching for fast contact opening

In addition to manual operation, the CSL switch offers the industry's only solenoid-operated switching for fast (2 cycle) contact opening. This quick response assures simultaneous operation of all three switches on a three-phase capacitor bank and prevents neutral shift and resulting high voltage to ground.

Longer life, lower maintenance

Control contacts are mounted above the oil, eliminating oil carbonization, reducing maintenance, and giving long, trouble-free service. Although the CSL switch has a guaranteed life of 10,000 operations, units have operated in excess of 30,000 times.

Let us show you how these higher-efficiency Westinghouse CSL oil switches can mean real dollars saved in your system. Call your Westinghouse representative, or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-60987

RATINGS

voltage:

Nominal system voltage: up to 14,400 volts
Maximum design voltage: 15,000 volts
Basic impulse insulation level: 95 kv BIL
Control voltage (electrically operated switches): 120 or 240 volts

current:

Thermal rating: 200 amperes continuous
Momentary rating: 9000 amperes rms asymmetrical
Short time rating (1 second): 6000 amperes rms symmetrical
Maximum inrush current rating: 12,000 amperes peak

YOU CAN BE SURE...IF IT'S Westinghouse

WATCH "WESTINGHOUSE LUCILLE BALL-DESI ARNAZ SHOWS" CBS TV FRIDAYS

Pile on the ice and snow

Let it sleet. Let it snow. Let the wind blow.

This cable can weather the storm.

Rome's reverse-lay preassembled aerial power cable has a built-in, high-strength messenger for staunch support. Falling branches—even some trees—can be supported by the cable itself!

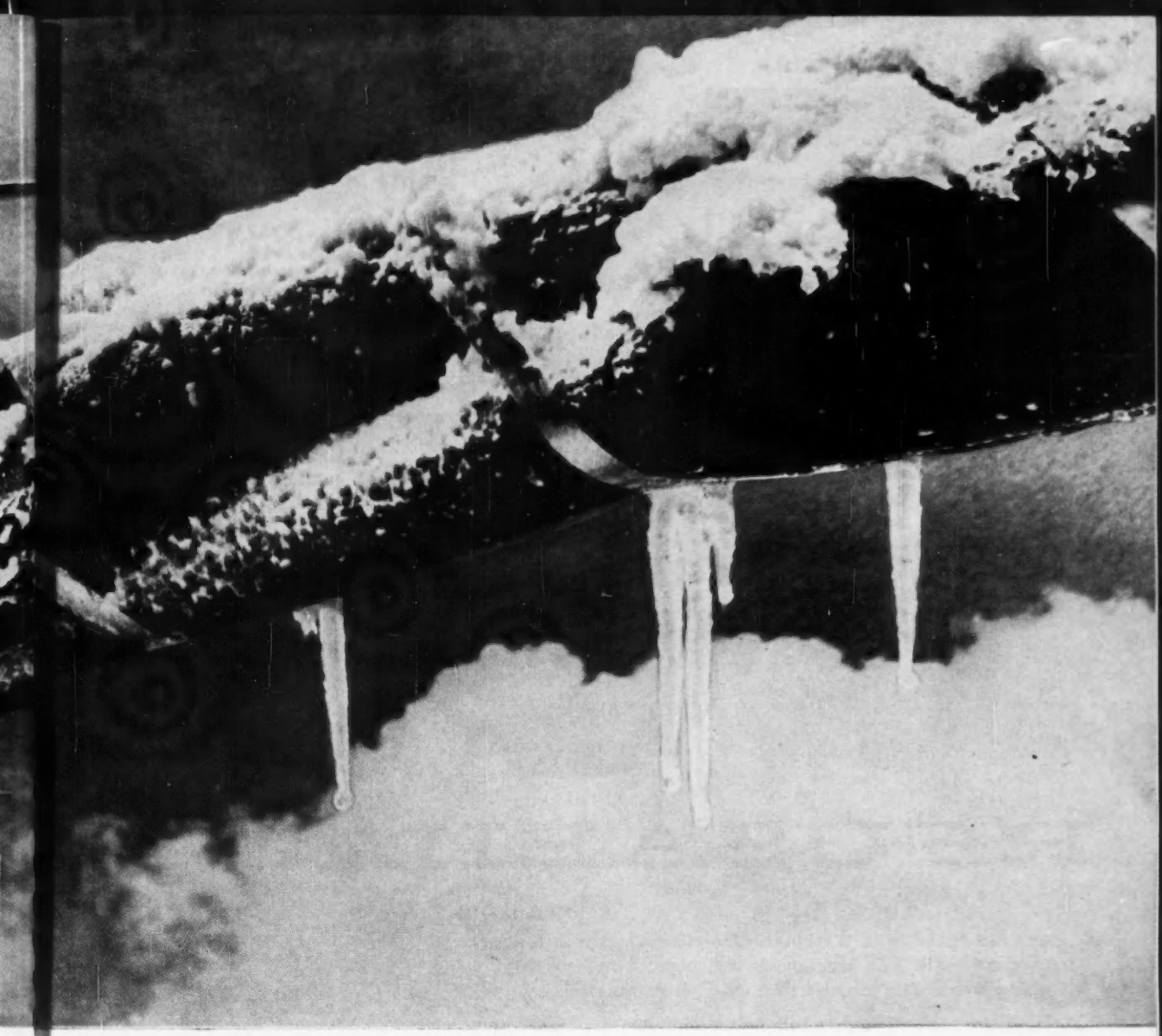
Fewer outages You can use this aerial cable to reduce the chance of outages during storms and high winds. Because it is fully insulated and jacketed for maximum resistance to moisture and tree abrasion, it prevents wet branches from shorting between phases. And it's *safer* for your line crews to handle . . . safer for the public too!

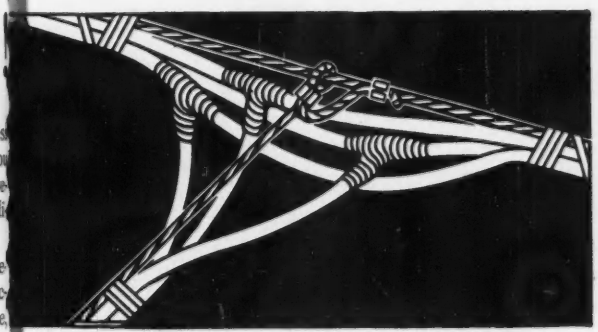
Routing more direct Because it is compact, you can route preassembled aerial cable more directly, with less right of way than is required for open-wire systems. You can run more circuits in less space. Less clearance is required, so you do less tree trimming—initially and periodically!

Wide range of constructions You can get Rome's preassembled aerial power cable in a wide range of constructions, rated up to 15 KV: Rozone (oil-base), Polyethylene or Rozone A (butyl-base) insulation, Roprene (polychloroprene) or Roseal* (flame-retardant polyethylene) jacketing.

Get all the details from your Rome Cable salesman, or clip and mail the coupon today!

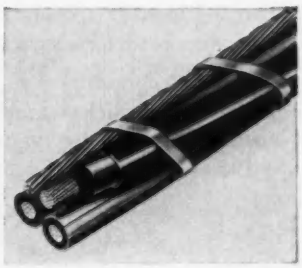
*Trade mark—Patented.





ASE OF TAPPING Long spans sometimes make mid-span tapping ecessary. Rome's reverse-lay preassembled aerial cable construc- on—where the direction of lay of conductors is reversed at regular tervals along the line—permits easy mid-span tapping. The re- ersed portions provide sufficient slack for taps *anywhere* along e line! This eliminates the necessity of making taps at the pole nds only. Stress is carried entirely by the messenger. Conductors an be untwisted for tapping without cutting—even while the line hot if conductors are unshielded (5 KV). Your linemen can use wire uards and rubber blankets for safety and make pole-end taps ithout use of a platform.

BETTER VOLTAGE REGULATION
Because of its close geometric spacing as compared with open-wire circuits, aerial cable has a lower reactance. Voltage drop is about half as great as typical crossarm construction and, for a given voltage drop, power can be transmitted twice as far.

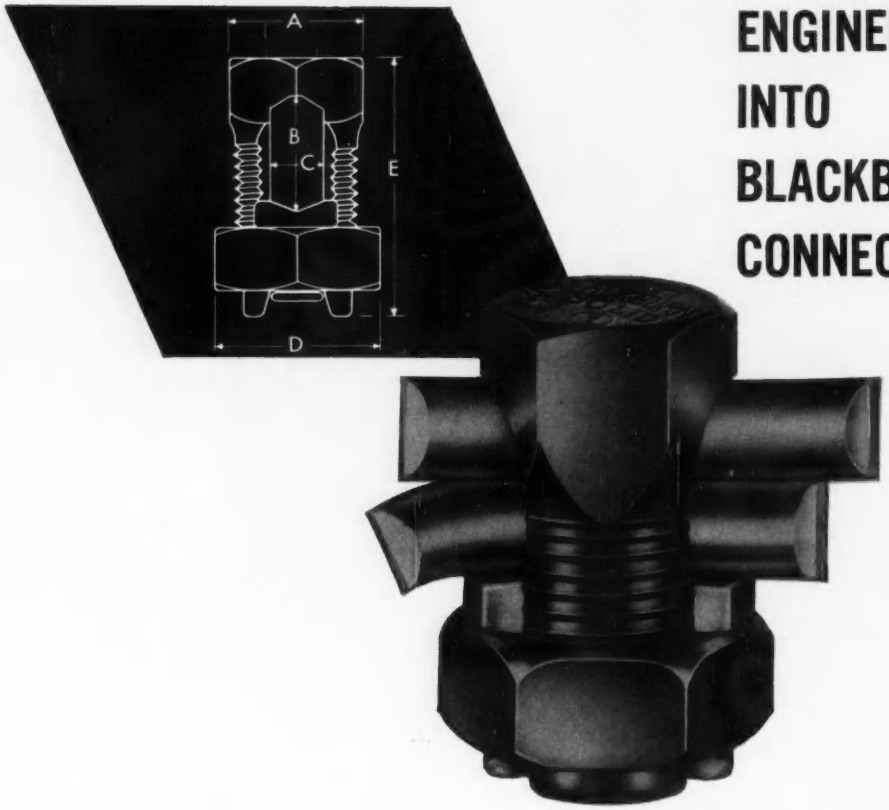


ROME CABLE
DIVISION OF **ALCOA**
Department 111, Rome, New York

☐ Please send me more information on the above.

Name .....
Title .....
Company .....
Street .....
City ..... Zone ..... State .....

MEET THE MAN
WHO'S DEDICATED TO **YOUR** JOB
YOUR ROME CABLE SALESMAN



ENGINEERED INTO BLACKBURN CONNECTORS...

REUSABILITY!

The big difference in Blackburn connectors starts with the way they are made. The basic material is high strength duronze, a silicon bronze alloy stronger than many structural steels.

High percentage of threads, both bolt and nut, plus proper selection of materials, reduces friction, increases thread efficiency and clamping force—clamping force is maintained on the conductors. Blackburn's strict inspection assures uniform high quality.

Blackburn connectors give better performance electrically. The greater thread efficiency provides a high clamping force that helps break through oxides on the conductor and improves conductivity. This high initial conductivity is maintained permanently.

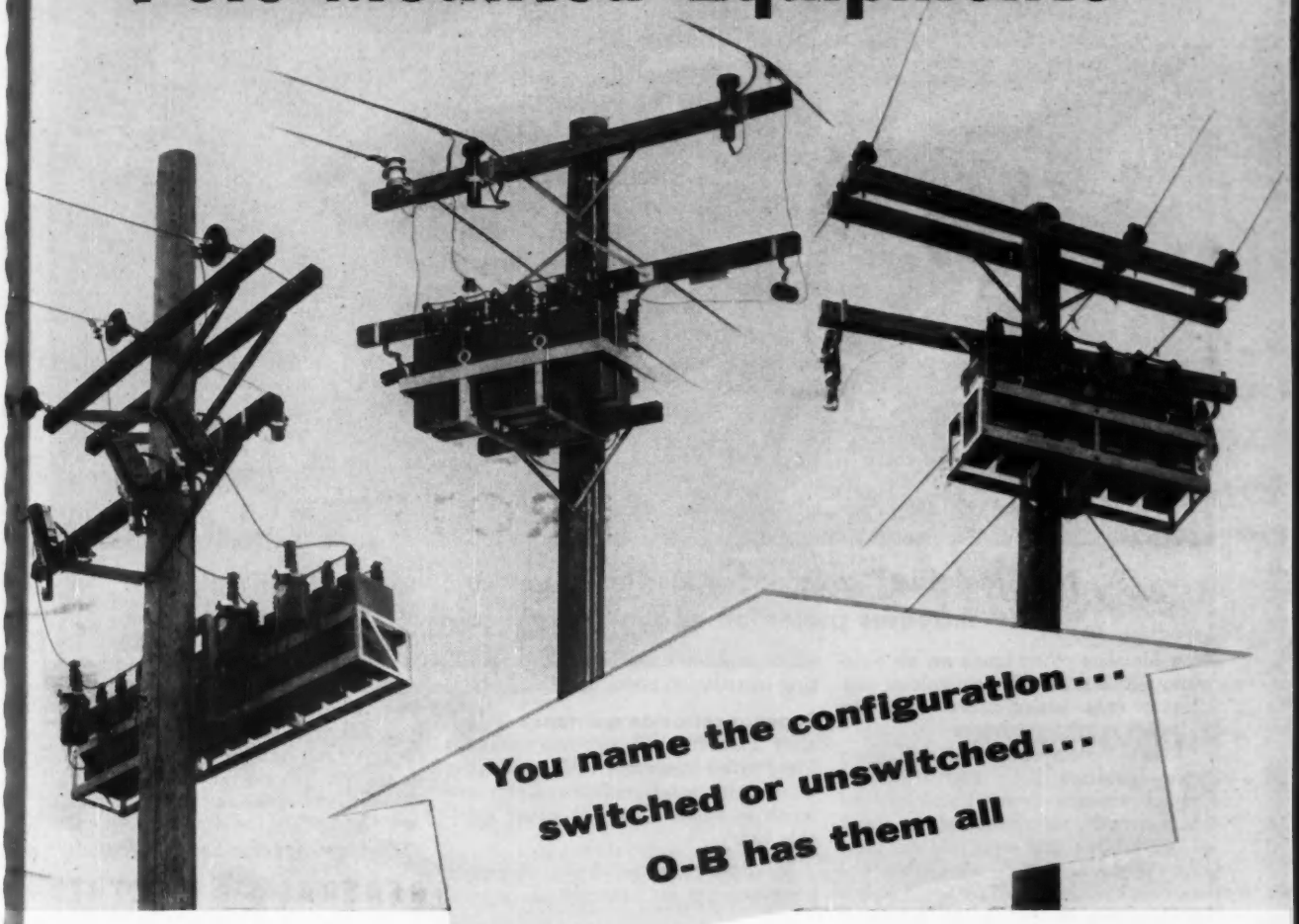
Because of the better materials, precision workmanship and careful inspection, Blackburn connectors are reusable . . . over and over. Write for samples.

LIVE BETTER ELECTRICALLY

Jasper BLACKBURN Corporation

1525 Woodson Road • St. Louis 14, Mo.

Buy VAREX In Your Choice of Pole-Mounted Equipments



We won't challenge you to specify a pole-mounted equipment arrangement that O-B can't supply. You might outguess us but there are literally thousands of combinations to choose from. Basically, you can have in-line, rectangular and cluster arrangements -- switched or unswitched, with your choice of switch manufacturer, and any number of units from 1 to 24.

There are a few points to make concerning the rack designs. Although the equipments are shipped on wooden skids, they are designed so that the lower frame members constitute a skid in themselves. The "boxed-in" style of the rack provides a permanent shield for the entire equipment.

Now for the convenience features. Our engineers know, for example, that linemen treat lag screws like nails, driving them into the pole when an equipment is mounted. So mounting brackets are arranged to give the lineman plenty of room for a full swing at the screw heads.

We also have rubber caps for capacitor and switch terminals, big lifting eyes, 5-kv insulated cable and any other quality feature you'd like to name. But despite these features, the big advantage is the Varex unit that goes into the equipment -- foil-cooled, stainless steel terminal studs, spring pressure contact on elements, low height, and with O-B's own wet process porcelain bushings in a compression assembly that assures leak-free operation. Regardless of the equipment you choose, you get the full range of Varex advantages.

OHIO BRASS COMPANY, MANSFIELD, OHIO

Ohio Brass HOLAN

PORCELAIN INSULATORS • LINE HARDWARE • CAPACITORS • LIGHTNING ARRESTERS
BUSHINGS • HOLAN TRUCK MOUNTED POWER DEVICES AND BODIES • BRONZE VALVES

4969-H

ANOTHER STEP AHEAD IN VOLTAGE REGULATION

New Melalast* cover finish for General Electric voltage regulators increases protection against animal-caused outages

New Melalast cover finish on all pole-mounted General Electric voltage regulators cuts maintenance costs by reducing regulator outage.

This G-E developed modified epoxy resin insulates both regulator and animal visitors from line-to-ground short circuits, yet allows a slight shock to send birds and squirrels on their way. Melalast finish eliminates the need for bushing "bird covers," terminal taping, or line-drop sleeves—cutting installation costs, too.

Superior corrosion resistance of Melalast finish further improves regulator life. Proven-in-service on General Electric distribution transformers, this new finish is better than any other available today.

Melalast cover finish—at no price premium—is an example of General Electric's continuing leadership in voltage regulators. It is another reason why G-E regulators cost less on the line. Ask your regulator representative for more information. General Electric Company, Schenectady 5, New York.

*Trademark of General Electric Co. 423-42

Progress Is Our Most Important Product

GENERAL ELECTRIC

FULLY INSULATED COVER

Protects Against Outages Caused By Birds and Squirrels

GENERAL ELECTRIC

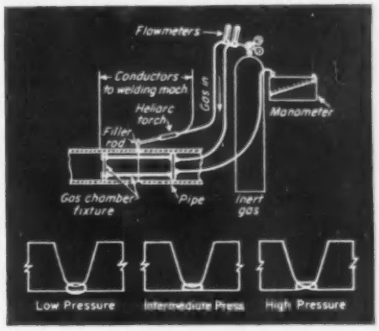
SUPERIOR DURABILITY of Melalast finish is possible because special grit-blast process cleans, roughens surface for excellent adhesions shown above. Label (left) on control cabinet door identifies Melalast cover finish on your new pole-mounted General Electric voltage regulator.

KELLOGG'S K-WELDING IN THE FIELD KEEPS PACE

Once restricted to shop fabrication, K-Weld® has recently been successfully adapted by Kellogg to meet the severest specifications for welding high-pressure-temperature power piping in the field. Currently it is being used in the erection of supercritical piping systems for some of the country's leading steam-electric utilities.

Unique among field welding techniques, K-Weld assures complete penetration of the root bead and a highly uniform internal contour *without backing rings*—through the use of controlled inert gas pressure inside the pipe. The technique can be used on pipe of any type or size during shop fabrication or in the field.

Kellogg welcomes inquiries on K-Weld and its complete service to the power piping industry from consulting engineers, engineers of power generating companies, and manufacturers of boilers, turbines, and allied equipment. An introduction to this service may be obtained by writing for Kellogg's new 12-page booklet, "The Eddystone Story".



K-Weld root bead is deposited while pipe interior is under controlled inert gas pressure in specially designed portable gas chamber fixture. Diagram shows details of fixture, and how interior weld surface can be controlled by varying pressure.

Fabricated Products Sales Division

THE M. W. KELLOGG COMPANY, 711 THIRD AVENUE, NEW YORK 17, N. Y.

A SUBSIDIARY OF PULLMAN INCORPORATED

The Canadian Kellogg Co., Ltd., Toronto • Kellogg International Corp., London • Kellogg Pan American Corp., Buenos Aires • Societe Kellogg, Paris • Companhia Kellogg Brasileira, Rio de Janeiro • Compania Kellogg de Venezuela, Caracas

POWER PIPING—THE VITAL LINK

®*Registered trademark of the M. W. Kellogg Company, Process Patented*

Here are answers to some about KPF switches

Q. *How can KPF switch blades maintain positive contact with switch clip under changing line sag conditions?*

A. Two heavy copper clips, bolted to a shoe carrying the flexible jumper, are mounted inside a special "horseshoe shaped" casting by two toggle bolts. These toggle bolts pass freely through the outer leaves of the clips, and the entire contact assembly "floats" on these bolts. Half-spherical bolt heads and adjusting nuts permit movement in any direction. The tension of the clip leaves on the blade is sufficient to insure positive alignment, since either clip or blade can follow the other to conform to line sag changes.

Q. *How can insulator stacks follow normal line sag changes?*

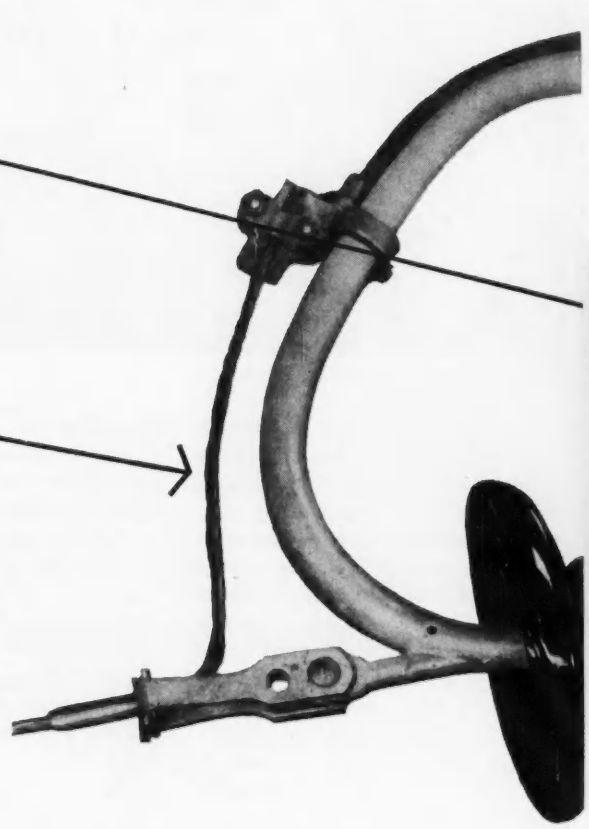
A. The insulator stack bearing units may be likened to limited universal joints. The actual bearing, a monel pin in an everdur trunnion, allows 90° movement of the rotating arm of the phase unit, as well as approximately 7° vertical movement to follow line sag. It is impossible for the bearing to bind under normal line stress, and insulator stacks always follow the sag of the conductor.

Q. *How are conductors connected to KPF switches?*

A. With KPF Type A switches, the user eliminates dead-end insulators. Any standard strain clamp can be used, and hot lines may be dead-ended directly to the phase units. Switch arms and dead-end eyes are integral with the insulator assembly. The conductor is lead through the strain clamp and on to a copper terminal on the switch arm. Aluminum conductors may be connected to the switch arm through special KPF terminals designed for this service. Type A switches may be mounted on a separate crossarm with conductors deadened below or above (for angle-pole installations, etc.). Switch operates equally well with or without line tension.

Q. *For what voltages are KPF air break switches available?*

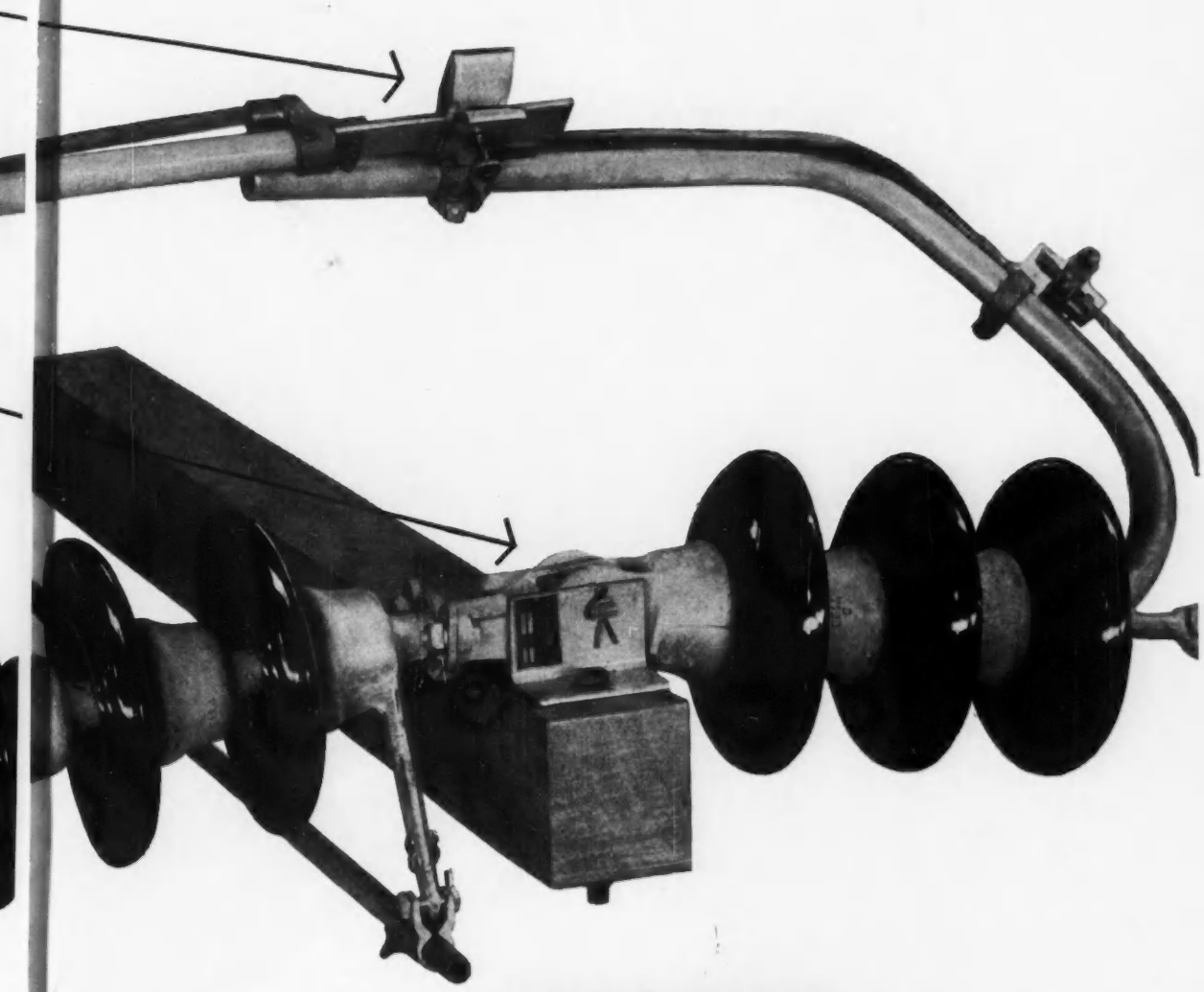
A. KPF Type A and S standard "line-tension" switches are available for common voltages from 7.5 to 110 KV. Special switches combining a disconnect with a fuseholder (Type UF, double-cross-arm mounting) and for use where line tension is not present are also offered in these same voltage ranges. Ground switches are available for Type A or S switches. Type R switches are offered for use where line tension is not present or it is desired to use a specific type of apparatus insulator.



KPF

Request Catalog or write for details.
Test on your system this month!

often-asked questions



KPF

AIR BREAK
SWITCHES

Standard for half a century

KPF ELECTRIC COMPANY
P.O. Box 1257E • Stockton, California
HOward 4-8381

5215

What's new in plant expansion?

Steadily rising costs are causing many electric utilities to take a searching look at traditional methods of handling plant expansion.

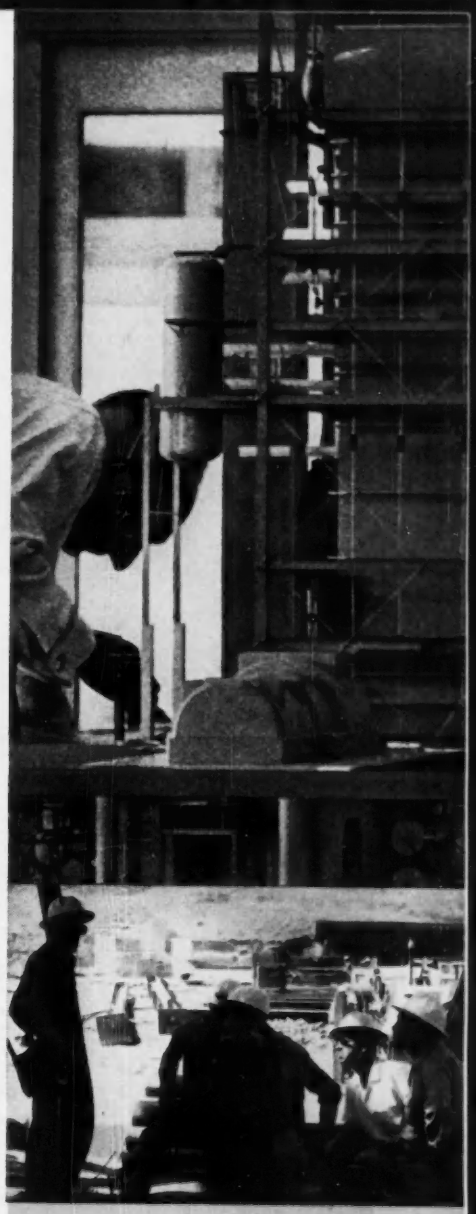
An increasing number of companies are finding that the total-responsibility contract, which has long been standard practice in the petroleum and chemical industries, offers important advantages to a utility.

When a single integrated firm is given full responsibility for design, engineering and construction and undertakes to deliver a plant that meets definite performance guarantees, then the contractor is also in a position to guarantee completion date and total cost—*and should be willing to do so.* With these two factors firmed up, financing problems are eased considerably. Risks are minimized, as the contractor assumes most of them. Lead time is shortened and continuity of the job is assured. The utility's own engineers, freed from a multitude of detailed responsibilities, can function on their proper level of operations management, broad supervision and long-range planning.

Furthermore, the integrated contractor, in control of all phases of the job and making a single profit, has a considerable advantage over a series of independent contractors handling separate phases. Through efficient management, procurement and scheduling he should be able to deliver more total plant value per dollar of investment.

It is Fluor's belief that the total-responsibility contract, with price and completion guarantees, is the best answer in many electric-utility situations, and Fluor is one of a very few engineering-construction firms serving the industry which encourage this type of contract. For detailed information on how the system works, write to Utility Sales Department, The Fluor Corporation, Ltd., 2500 South Atlantic Boulevard, Los Angeles 22, California.

HOISTING THE DRUM—dramatic moment in the construction of every steam station. This one is being installed by Fluor at Cameo, Colorado, where Public Service Company of Colorado is adding a 44-mw. unit to its existing plant.



When you consider expansion . . .
the most important investment
you can make is in the
creative ability of men.

FLUOR

Engineers and Constructors

NOW!

Westinghouse research announces another major achievement in fluorescent lamp development!

15,000 LUMENS IN A LIGHTWEIGHT, 96-INCH SUPER-HI™ LAMP!

Through new ballast equipment and improvements in lamp design, Westinghouse engineers have increased the light output of an 8-foot S.H.O. Lamp to more than that given by *two* standard Slimline lamps. Even more remarkable, the extra bonus of light you get in these new Super-Hi™ lamps was not achieved at the sacrifice of their light weight. In fact, similarly rated fluorescents weigh about twice as much as the S.H.O.—almost *five tons* more of glass is hanging from the ceiling in a 5000 lamp installation.

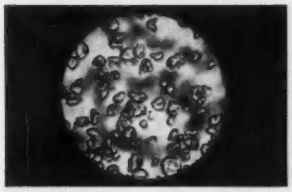
Super-Hi™ lamps deliver their full light output regardless of their position in fixtures. They have a smooth, tubular surface, free from dust-catching pockets or indentations which quickly cut down the light. S.H.O.'s are rated at 7500 hours life. List price, $6.95.

YOU CAN BE SURE... IF IT'S

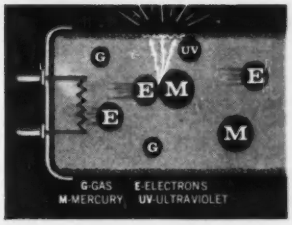
Only Westinghouse brings you these

6 LIGHT-BOOSTING ADVANCES

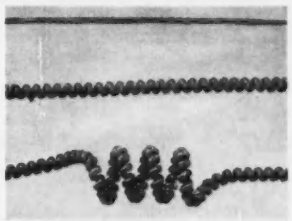
1. ULTRALUME™ PHOSPHORS. Westinghouse research has proved that the size of the individual phosphor particles which coat the inside of a fluorescent lamp have a direct effect on the amount of light given off. Research has determined a definite range and distribution of particle size. Now, a new and exclusive Westinghouse process selects particles within the range for more efficient light-producing phosphors.



2. MIXED GASES. All fluorescent lamps contain mercury and gases. The gases serve as conductors until the mercury is vaporized. The combination of these gases and mercury vapor then converts electricity into ultraviolet radiation, which, in turn, causes the phosphors to "fluoresce," or light up. Westinghouse engineers have determined that a carefully proportioned mixture of several rare gases produces the best results. Westinghouse uses the right mixture and pressure for each type of fluorescent lamp.

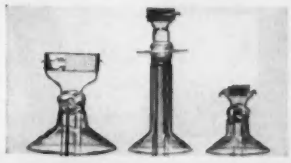


3. TRIPLE COILED ELECTRODES. When a fluorescent lamp is turned on there is a sudden initial bombardment of the electrodes by heavy mercury ions. To reduce this bombardment the emission material which coats the electrode must be heated. If the emission material is not protected, lamp life will be shortened. Westinghouse uses triple wound coils to make sure that the carefully determined amount of emission material is heated quickly and is adequately protected from bombardment.

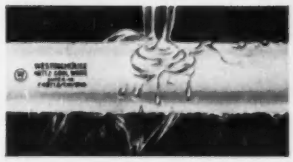


4. PLATED LEADS. The terrific electron bombardment which takes place inside a fluorescent tube eventually causes particles of the metal supports and leads to sputter off and cause "end blackening." To prevent this, Westinghouse plates the lead wires with super-hard Chrome-Vanadium. Result: tubes that *stay* brighter, end to end.

5. "CUSTOM" ANODES. Anodes act as buffers to cushion the terrific shock of electron bombardment and prevent excessive "sputtering" of emission material from the electrodes. Since the electrical characteristics are different for each type of fluorescent lamp, Westinghouse anodes are especially engineered to fit the electrical requirements of each type of lamp.



6. SILICONE "RAINCOATS". Moisture is the invisible enemy of fluorescent lamps. In high-humidity areas, moisture can collect on the exterior surface of the lamp and prevent it from starting. To protect against moisture accumulation, Westinghouse fluorescents are given a special Silicone coating, or "raincoat," which disperses this film into harmless droplets.



You get

MORE LIGHT PER DOLLAR

from Westinghouse

2800 LUMENS
(cool white)

IN THE NEW "UNIVERSAL" PREHEAT-RAPID START LAMP . . . Now you can greatly simplify ordering, stocking and maintenance by specifying this one lamp for the job that two different types have been doing! Specially designed electrodes allow you to use this 40-watt lamp on either your present rapid start or preheat circuits with no loss in lumen output. And prices have been reduced to only $1.25 list—5¢ less than old-style Rapid Start Lamps!

9000 LUMENS
(cool white)

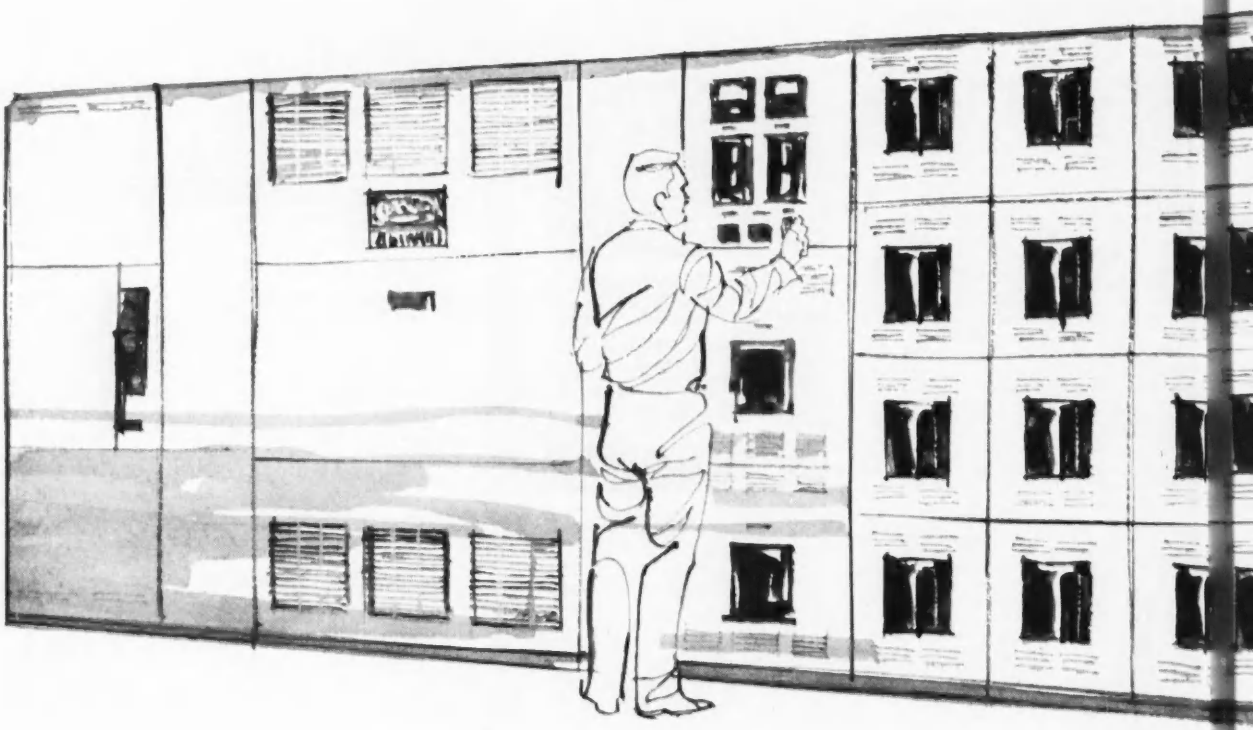
IN THE BRIGHTEST 96" HIGH OUTPUT LAMP YOU CAN BUY . . . Light output improved 23% over present H.O. type (High Output) lamps to make this the most economical 96" H.O. type lamp ever developed for application where high output lamps are used . . . 9300 lumens in white and warm white. This brightest of all 96" H.O. type fluorescents is rated at 7500 hours life—more than 2 years actual use in the average installation—and they're designed to operate on present 96" H.O. ballasts.

3200 LUMENS
(cool white)

IN THE HIGHEST-RATED 40-WATT LAMP . . . Get 21% more light using your *present* fixtures . . . 3310 lumens in white and warm white! This new lamp is the only fluorescent with no "lazy ends"—even the *bases* let light through (optional at slight extra cost). Life rated at 7500 hours at 3 hours per start. List price, $1.45.

CONTACT YOUR LOCAL WESTINGHOUSE LAMP AGENT, OR WESTINGHOUSE LAMP DIVISION, BLOOMFIELD, N. J.

Westinghouse

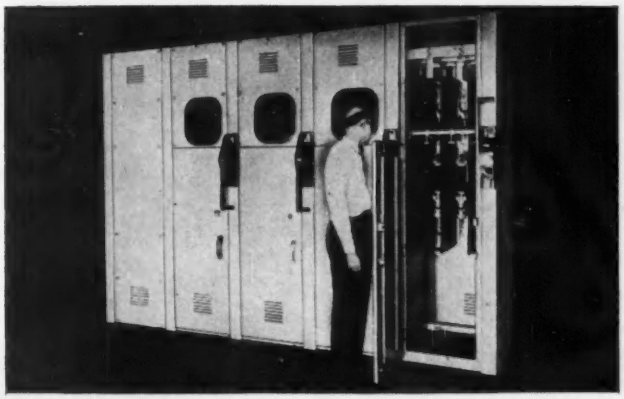


AHEAD

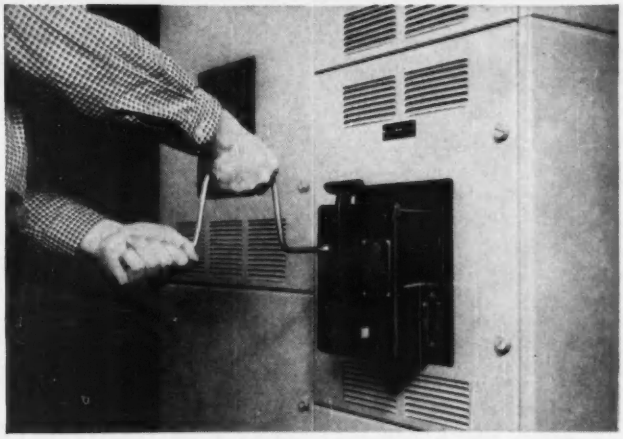
An I-T-E Secondary Unit Substation is more than just a source of power for your central station requirements. It's an investment that puts you years ahead in station equipment.

The new I-T-E K-LINE circuit breakers are unmatched for safety, protection and lasting economy. Manual quick-make, extended range trip adjustment, and closed-door disconnect are all combined in a single, compact design. The transformer is built by I-T-E for your own particular application on a basis of fresh engineering ideas original with I-T-E. The I-T-E primary fused interrupter switch or metal-clad circuit breaker closes even into a fault with complete safety for the operator, and the entire substation is assembled and shipped from a single plant . . . you are assured complete coordination, easy assembly, and on-time delivery.

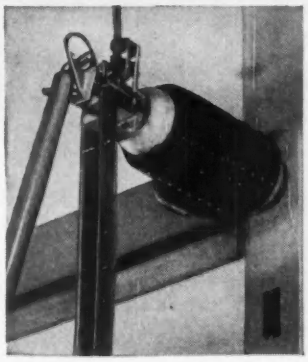
If you want to be ahead in the equipment you buy, look into the broad I-T-E line. Users claim you can't buy better, yet it costs no more.

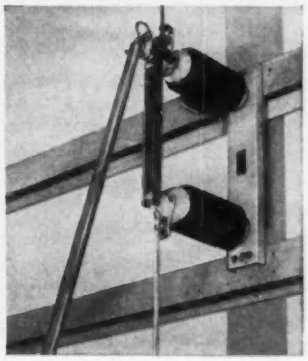


Safe switching. Yes, there's real economy in fused power switching centers, but make sure you also get the *extra safety* only I-T-E offers. In every I-T-E Power Switching Center, you have the assurance of knowing that switches can be closed *even into a fault* with complete safety for both personnel and equipment. Unique standardized cubicles and building block construction reduce engineering expense (the saving is passed on to you), and also shorten the time between order and delivery. Equipment arrives on the job in sturdy, preassembled units, ready for easy, fast installation.



Disconnect circuit breakers with door closed. I-T-E low-voltage metal-enclosed switchgear gives new operator safety. K-LINE circuit breakers can be moved from connected, through test, all the way to disconnected position without opening door. Overload setting easily adjusted to new load conditions by expanded calibration overcurrent trip device. Manual quick-make affords safer operation and extends contact life. Compact construction permits 4-high mounting of circuit breakers of up to 600 amp rating. K-LINE ratings: 600 v a-c, 250 v d-c, 15-1600 amp continuous.





Hear it snap shut. New I-T-E hook-operated disconnecting switches provide positive indication that they have closed completely. An easily audible "snap" is heard. And extra-large latch members serve as visual assurance. Parallel blades are widely spaced and heavily braced for maximum rigidity. Roomy hook-stick eye and pryout motion in opening contribute to the easy operation of the switch. Ratings: 7.5 through 69 kv, 600 and 1200 amp.

U-3

I-T-E CIRCUIT BREAKER COMPANY
1900 Hamilton St., Philadelphia 30, Pa.

- ☐ Secondary unit substations
- ☐ Power switching centers
- ☐ K-LINE circuit breakers
- ☐ Hook-operated disconnect switches
- ☐ Isolated phase bus
- ☐ Metal-clad switchgear (4.16 and 13.8 kv)
- ☐ Reclosers
- ☐ Primary unit substations
- ☐ Other . . . . . .

Name . . . . . Title . . . . .
Company . . . . . .
Street . . . . . .
City . . . . . Zone . . . . State . . . . .

SEND COUPON OR WRITE

Get complete, up-to-date information on I-T-E equipment.

I-T-E CIRCUIT BREAKER COMPANY

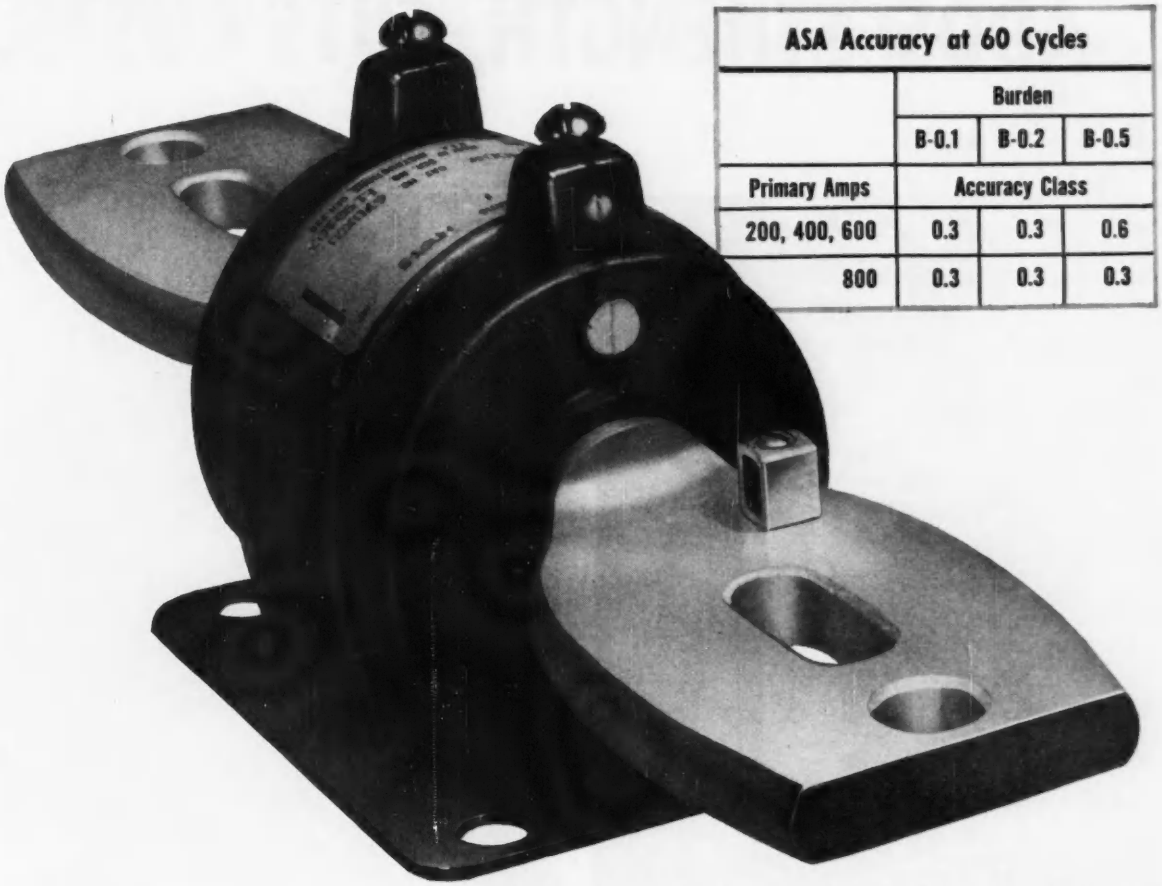
SAVE UP TO 40% ON NEW INDOOR CURRENT

JCX-0 line available in 200, 400, 600, and 800:5-ampere ratings

A full line of low-priced, miniature, indoor current transformers is now available from the General Electric Company. Designated "Type JCX-0," the new, butyl-molded units are available in 200, 400, 600, and 800:5-ampere ratings, with non-removable primary bar. Design simplification and standardization in the JCX-0 line permit prices as much as 40% below those for equivalent indoor-outdoor transformers. Specifically for indoor use, all JCX-0 transformers carry a new, grain-oriented, silicon-steel core

GENERAL ELECTRIC BUTYL TRANSFORMERS

ASA Accuracy at 60 Cycles			
	Burden		
	B-0.1	B-0.2	B-0.5
Primary Amps	Accuracy Class		
200, 400, 600	0.3	0.3	0.6
800	0.3	0.3	0.3



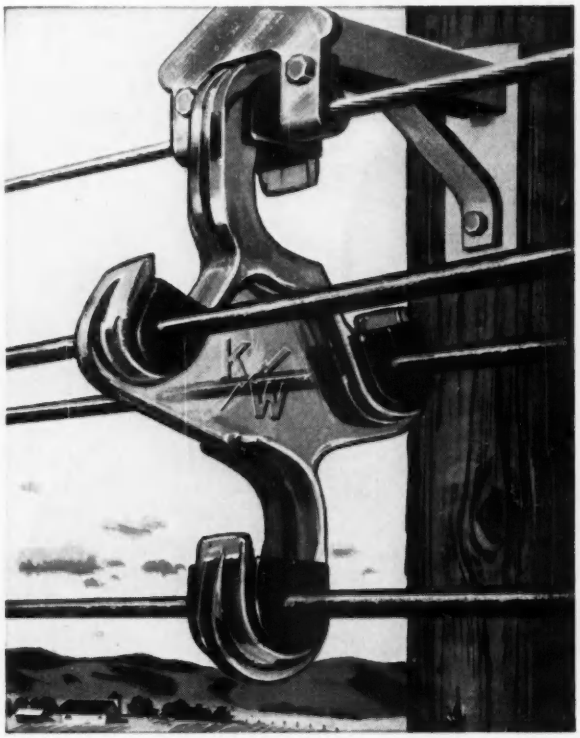
800:5-amp General Electric Type JCX-0 Current Transformer (actual size)

having a saturation point considerably above that of cores used in standard indoor-outdoor models. **FOR MORE INFORMATION** on General Electric's complete, new line of JCX-0 current transformers, contact your G-E apparatus salesman. Or, write General Electric Company, Section 629-4, Schenectady 5, N. Y.

Progress Is Our Most Important Product

GENERAL ELECTRIC

NEW K/W SPACER TYPE AERIAL ADDS STRENGTH, CUTS COSTS,



One-Piece Design—Supports 1200 Pounds

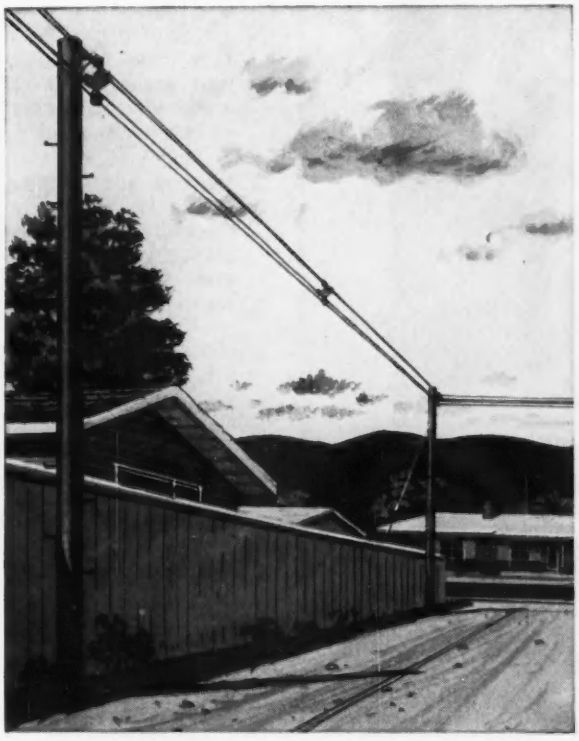
New solid spacer design has no loose parts nor movable pieces . . . it's simple, reliable and strong. Can support a minimum distributed load of 1200 pounds. Easy to install, since only one conductor is handled at a time. Snap-in grommets shaped to ease installation. Can be used with or without crossarms; standard hardware available from many suppliers.

Cuts Material Costs and Tree Trimming

A KW Spacer Cable system can be installed for as little as one half the cost of standard pre-assembled aerial cable!

Compared to open-wire weatherproof, the reduced tree trimming and improved system dependability resulting from messenger supported cables can justify the spacer system's slight additional cost.

CABLE SYSTEM IMPROVES APPEARANCE



Reduced Spacing Improves Appearance

Compared to open wire, closely spaced conductors present a neat, compact arrangement that improves appearance wherever it is installed. Close 6-inch spacing also improves system electrical characteristics . . . permits easy phase identification and proper load balancing. Usual installation practice is approximately 35 spacers per 1000 feet.

WITH its unique new spacer design, KW now offers you unsurpassed dependability and handling ease for cable systems operating at 5 to 15 kv, by using only one spacer for the whole range of voltages.

No tools or tightening necessary: entire spacer system snaps in and locks.

The system consists of four parts: (1) Phase conductors (EC grade aluminum, minimum conductivity 62 per cent, insulated with Polyethylene or Butyl rubber with Neoprene jacket); (2) Special high-strength messenger; (3) Molded one-piece spacers; (4) Molded Neoprene cable-retaining grommets.

Standard hardware is available from leading suppliers. Call your Kaiser Aluminum sales office or KW distributor for immediate service and full information.

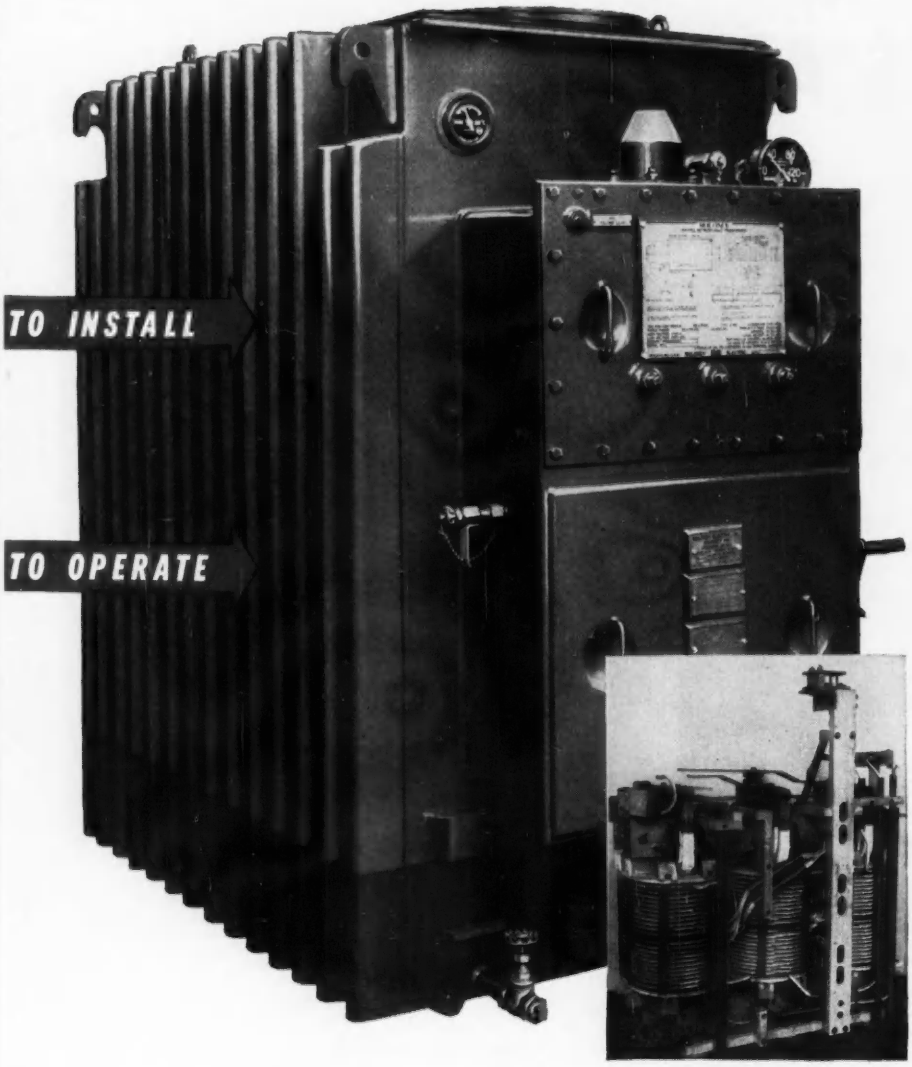
Kaiser Aluminum & Chemical Sales, Inc., 1924 Broadway, Oakland 12, California.

KAISER ALUMINUM

"IF IT CARRIES CURRENT, KW CARRIES IT!"

See "MAVERICK" • Sunday Evenings, ABC-TV Network • Consult your local TV listing.

ECONOMICAL



BECAUSE:

1. Each tank side completely corrugated out of one piece of metal, requiring welds only at the corners.
2. No thinning of the metal occurs at corrugations.
3. The corrugations do not need sidewall bracing therefore, another possible source of corrosion is eliminated.
4. Tank is easily cleaned from above and there are no inaccessible areas to hinder painting.
5. The tank and handhole covers are welded in place to eliminate the possibility of leaks, however, bolted covers are available if required.
6. Network transformers with corrugated tanks are smaller in size than old style tube type tanks.
7. Reduced size allows installation of larger units in existing vaults.
8. Protection against corrosion is provided by undercoating the base and the lower portion of the tankwall.
9. The core, coil, leads, supporting members and framework are uniquely combined to give ample electrical clearance and to obtain a rugged unit that is exceptionally compact.
10. Low sound level means better customer relations.

Moloney Network Transformers are uniquely designed both inside and out to provide a superior unit for use on secondary network distribution systems. The corrugated tank coupled with a compact, rugged core and coil assembly having high overload capability, offers the potential user many reasons for purchasing Moloney Network Transformers.

These units are available in types conforming to EEI-NEMA Standards or in types especially designed to meet the requirements of your network system.

Specify Moloney Transformers for every application . . . All Along The Line.

ME59-10

MOLONEY ELECTRIC COMPANY

Transformers for Utilities, Industry and Electronic Applications

FACTORIES AT ST. LOUIS 20, MO., AND TORONTO, ONT., CANADA

Sales Offices in All Principal

Editorial Comment

NOVEMBER 30, 1959

Good Earnings Play a Constructive Role

Profits should be viewed as a dynamic force that puts the drive behind the American economy—rather than as a necessary evil.

That goes for regulated business—as well as for unregulated business.

These are the hard conclusions drawn from a year-long study conducted by a top level committee of Bell System executives. Highlights of this report are being carried in a three-part series beginning in this week's Management Newsletter (p 119).

The responsibility for understanding and accepting this constructive role of adequate earnings falls first to management. Only if management is convinced of the long-range contributions which good earnings can offer to the growth and health of the utility business is there any chance that this view can be carried to regulatory bodies and to customers.

We know from first hand experience and from a study of rate cases that many members of utility management think earnings of around 6% are ample.

But forward looking management is coming to realize that inflation is overtaking the tremendous technological advances that have helped keep electric rates on an even keel. There is a real question as to how long earnings at current levels will allow the electric utility industry to make its maximum contribution to the U. S. economy.

The very urgent need for management attention to good earnings is carefully spelled out in the Bell System study which was prepared for the American Telephone & Telegraph Co. We believe it deserves your wholehearted consideration.

Proof Is in the Polling

Investor-owned utilities have come off nicely in elections over the past 13 years which have pitted them against public power opponents in contesting ownership of facilities or rights to distribute.

A recent PIP survey (see p 77), covering the interval, shows a virtual 2:1 supremacy in favor of private power in 240 such poll scuffles. This indicates a fairly healthy situation, now augmented by returns from this month's few elections which bore on private vs public power issues.

An interesting point made by the PIP survey is that private companies came out ahead more often than not in 22 states, falling behind in nine others. Some might be surprised to note that Ohio, with no federal power projects, had the worst record, while Oregon, in the heartland of federal power country, saw local voters reject public power 29 times out of 31.

Despite it's setting Oregon's voters apparently have approved the private utilities' operations over the 13 years. The companies are election-minded; they've had experience. Their public relations are good: witness Portland General Electric Co's fish and recreation programs (EW, Nov. 23, p. 48).

It is unnecessary to caution these companies to extreme vigilance, to warn them against smugness. They know the lesson by heart.

But a word of caution might well be directed at companies in other states where public power has come off second best. Circumstances which have thrown the prize to private enterprise are not guaranteed. Lacking a true and recognizable private power image on a national scale, each election must be fought on its own grounds.

Proof of the political pudding is in the polling, and the time to start preparing for next November is right now.

Ten Utilities Join Avco in 'Hot Gas

Based on magnetohydrodynamics principles, study could bring increase in operating efficiency at competitive costs

A group of power companies has thrown its support behind the efforts of Avco Corp to develop electricity by the direct conversion of heat. The utilities will invest about $230,000 next year in furthering Avco research, which could lead to a big increase in operating efficiency over today's thermal plants.

This prospect stems from experiments on magnetohydrodynamics (MHD)—a principle that dates back to around 1900—in which superheated ionized gas substitutes for the generator armature. A laboratory device at the Avco-Everett (Mass.) Research Laboratory has produced 10 kw.

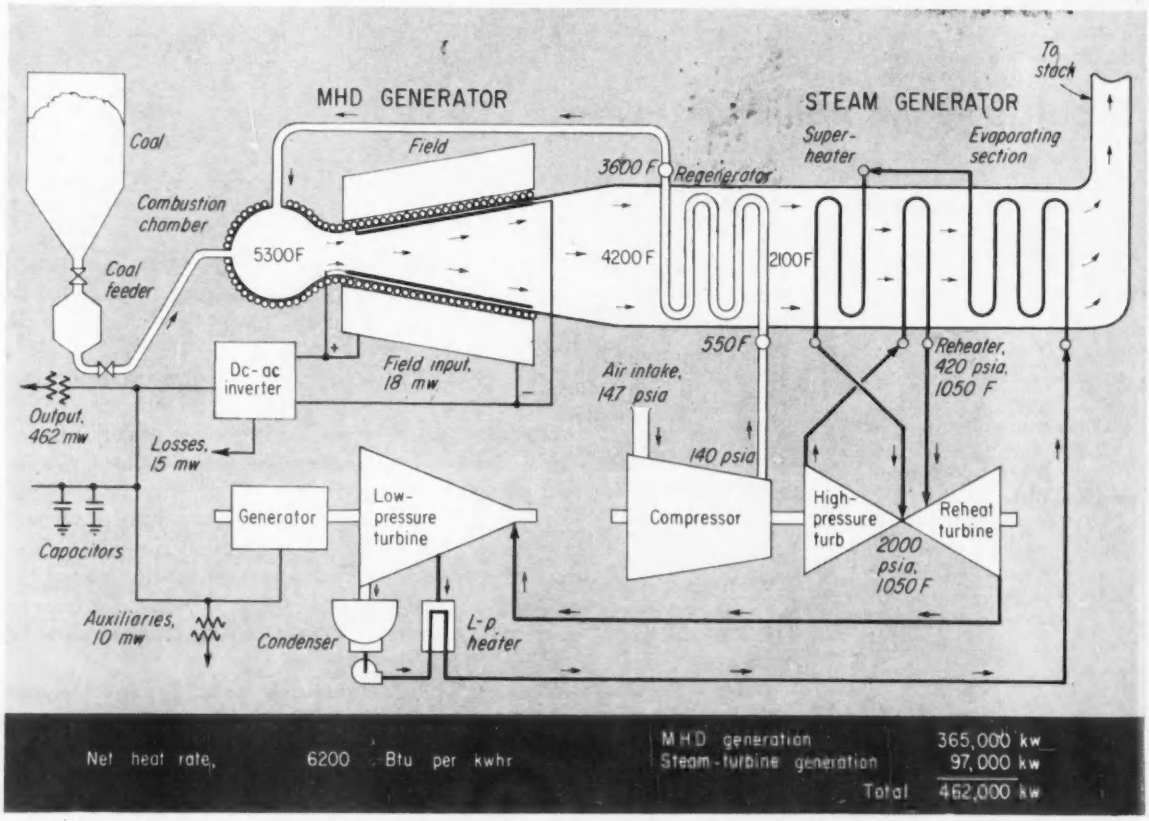
American Electric Power Service Corp, headed by Philip Sporn, will serve as agent for the utility group in carrying out the joint venture. The utility companies include:

Appalachian Power, Central Illinois Light, Dayton Power & Light, Illinois Power, Indiana & Michigan Electric, Indianapolis Power & Light, Kansas City Power & Light, Louisville Gas & Electric, Ohio Power, and Union Electric.

This Avco-utility team will design, build and test a prototype MHD generator calculated to put out 100 kw dc by burning a conventional fuel. Conversion to electrical energy will come from forcing the combustion products through a magnetic field. These hot gases, ionized by temperatures upwards of 3000F and possible seeding with traces of such alkaline metals as potassium or cesium, form the moving conductors of an electrical generator, functioning like moving coils in a conventional machine. Electrical energy is collected on plates which connect to outgoing leads of the generator.

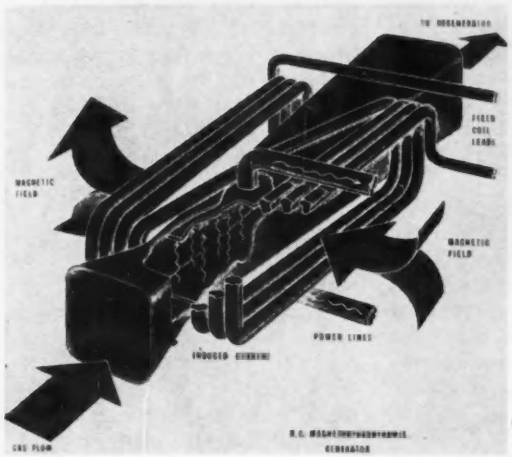
Construction and testing of this prototype is expected to cost $350,000. The utilities will contribute about two-thirds. Avco will provide the remaining third, plus knowledge gained from missile research and from over $100,000 already invested in the preliminary MHD generator model, which has put out 10 kw for short periods.

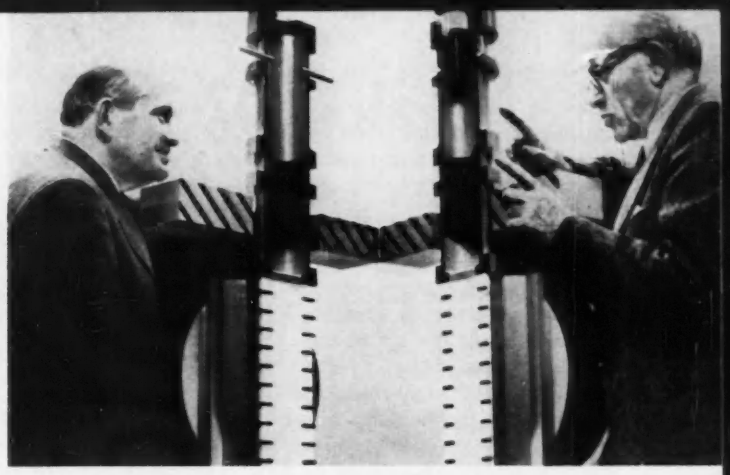
This research "represents some highly intriguing and exciting possibilities," said Sporn. MHD could eliminate "part of the boiler steam piping, steam turbine, steam condenser, boiler feed pumps, and a host of



HOT GAS CYCLE in proposed plant could achieve low heat rate of 6200 Btu per kwhr—a 25% improvement over best plants planned today. Output would be 450 Mw dc on flow rates devised by Sporn and Avco's Kantrowitz

Research





OPTIMISTIC OUTLOOK of Victor Emanuel, left, Avco chairman, and Philip Sporn is expressed before model of 10-kw experimental MHD generator. Next step is to build 100-kw unit

IONIZED GAS FLOW through magnetic field can replace function of armature and saves much of heavy turbine equipment

other assorted equipment" used in today's plants.

Successful commercial application of the MHD system could lead to thermal efficiencies of up to 60%. Power costs should be lower than those expected from the most efficient (40%) fossil-fueled plants under construction today, commented Sporn. Solution of remaining problems might take ten to 25 years, but the results should still compare favorably with the historic gain of 1% per year in thermal efficiencies.

Avco's research director, Arthur Kantrowitz, was more optimistic, predicting commercial use in ten years. He described a cycle in which an MHD generator would function as the high-temperature element, exhausting unexpended heat into a conventional steam system (see diagram). Most of the power output would come directly from the MHD topping section, boosting thermal efficiency to 55%. A similar system could derive its heat from a nuclear reactor, Kantrowitz declared.

In the hypothetical flow cycle, atmospheric air is compressed to about 140 psia and heated to 3600F. Coal combustion raises the gas to 5300F and it passes through the MHD generator producing about 360-Mw dc.

Exhaust gas at 4200F passes through regenerative heaters, drops to 2100F and flows to the boiler. The steam then drives a conventional turbine supplying compressor power and produces 107 Mw ac.

Problems remaining to be solved include a better understanding of MHD phenomena and development of materials that can handle gases in the 3000 to 5000F range. Another handicap is that dc generation appears to be more feasbile than ac, so use of conversion equipment would be required at a capital cost addition of about $40 per kw.

The study is exploring the potential of both coal-burning and nuclear-fueled MHD plants. In one analysis on an open-cycle coal plant with a net output of 450 Mw, Sporn noted that the larger sizes of MHD generators are more attractive in most features.

Voters Favor Private Utilities

Private electric companies win public-private election issues by 2:1 margin; Glasgow, Ky., refuses TVA power

The public-private power hassle reached its usual fever pitch in scattered towns across the U. S. on election day this year as voters lined up at the polls to decide the fate of power systems—both public and private. Results were two-fold:

First: Private power emerged the victor in more cases than not. A victory not surprising in the light of voting history. Private power has traditionally won these issues at the polls, and by a margin of about two to one, according to a 13-year election survey finished late this summer for the Public Information Program by Central Surveys, Inc.

Second: Winning margins were narrow in many cities. In one case 16 votes made the difference.

The returns that have filtered into Electrical World thus far show the following results:

For Private Ownership

Glasgow, Ky.—Kentucky Utilities Co won out for the 23rd straight year to continue delivering power to this town of over 7,000. The margin was narrow—182 votes—but the victory was a major one. Glasgow became the first town in history to refuse TVA power, observers said. This, despite the fact the town is surrounded by big TVA generating plants.

TVA proponents in the town had made pre-election promises of up to 60% rate reductions if public power won out on election day. But TVA itself refused to be committed on rates, commenting, "We will be

happy to discuss power supply arrangements with you when you acquire your distribution system."

Kentucky Utilities concentrated its campaign against public power by stressing the service it had provided. Both sides pushed their campaigns through newspaper ads in two local papers. In addition, KU was boosted in the editorial pages of one of the papers. The other paper remained silent on the issue.

The public power ticket whipped up two radio programs daily with speeches by local businessmen. KU countered with a womens' corps that spread company goodwill from door to door, and also distributed promotional pamphlets. The final tally: 1,371 to 1,189.

Decatur, Ind.—Voters chose to turn over the city-owned power plant to Indiana & Michigan Electric Co here by a vote of 2,040 to 1,263. Farmers gave I&M its strongest support, complaining the city system was inefficient—service was poor and power sometimes inadequate, they said. Farmers claimed their electric motors and other electric farm equipment were being ruined by city power.

The vote reversed a decision made in a referendum earlier this year to keep the plant in the hands of city officials.

But those favoring the sale said they will ask for a reappraisal of the city plant's value. A court-appointed investigating team had set the plant's value at $170,000 above an I&M appraisal just a few days before the election. The city last June entered an agreement with I&M to sell the plant for $2,099,100, and the Nov. 3 vote was to approve the sale at that price. The newer appraisal upped plant value to $2,275,000.

Paducah, Ky. — Private power won out by a 16-vote edge in Paducah when Robert C. Cherry was elected mayor. His opponent, Richard E. Fairhurst, carried on an apparently noisy anti-KU campaign described as "violent" and "outspoken." The winner urged caution in acting hastily on recommendations to seize KU's Paducah distribution system and in making a move to buy TVA power.

Leitchfield, Ky. — Although no showdown action was on the ballot in this small town of about 1,300 population, the private utility got a vote of confidence from townspeople, who elected a pro-private power city council that included KU employee Watt Buyers. They defeated a city council ticket that ran on a public-power platform.

For Public Power

Princeton, Ky.—Voters okayed seizure of KU's facilities here by right of eminent domain. Although estimates of the town's cost to go into the electric business exceed $1 million, the condemnation of KU's system can be financed by revenue bonds. This town of roughly 5,000 people became eligible to buy TVA power under the terms of the TVA self financing bill.

But before the town can buy TVA power it will have to meet KU in court. The utility has filed a suit attacking the legality of the election. KU is basing its charges on three counts: (1) The utility's substation is outside Princeton city limits, thus the city has no right to seize it. (2) The same KU facilities also serve customers living outside the city, accounting for a substantial portion of its output. (3) Notice of the election was inaccurate and misleading, KU says. The election notices referred only to KU property within the city, and were not published twice in local papers as required by law.

Genoa, Ohio—Voters once again, by a 513 to 213 vote, turned down Toledo Edison Co's bid to buy the city's distribution system. The same issue was defeated by 200 votes last year when the utility offered to buy the system for $262,501. Supporters of the sale insisted it was the only way the small community could raise the funds to pay for a sewage treatment plant ordered built by the State Pollution Control Board.

13-Year Election Survey Reveals Private Power Trend

Private utilities have held about a two-to-one lead in election victories since 1946, a recent PIP survey of elections showed. All 240 elections studied involved a public ownership issue where actual power facilities or distribution rights changed hands. Study shows:

- Private power has won 155 issues to 85 for public power over the 13 years.
- Even when voters okayed seizure of private electric property, in almost half the cases public ownership never went into effect because of reversals or delays. In some cases, towns later voted to continue service from the private companies. Apparently, some towns vote for public power mainly to squeeze concessions from a power company. Other public power attempts have failed from sparse funds or legal technicalities.
- Private companies won more elections than they lost in 22 of the 34 states that voted in the last 13 years. Public ownership has won more times in nine states during that period.
- Oregon has the best election record for private ownership—companies have won 29 times and lost only twice. Ohio has the worst record for private ownership, where the companies have won only three times, lost 14.
- Public ownership won more total elections in only one year—1949. In 1953 equal numbers won and lost.
- Close voting has been the rule. The overall record, considering all votes cast, favors private power 57% to public power 43%.
- In three of the 13 years public ownership got more total votes (in 1949, 1951 and 1953). But in two of these years (1951 and 1955) total votes were heavily weighted toward public ownership by a single election in a large community, where voters refused to sell municipal systems.
- In elections involving loss of company property, private utilities have won 91 out of 139 times.
- In elections involving acquisition of public systems by private utilities the private companies have won 64 times, public 37.

Court Test Likely on ECAP Ads

Action probably will follow FPC's Ruling on Accounting Procedures for Private-vs-Public Advertisement Series

The much-delayed hearing on the accounting procedures used by 76 utilities for contributions to the Electric Companies Advertising Program, finally got rolling last week before Federal Power Commission Examiner Edward B. Marsh.

The case, which has moved in fits and starts ever since it was first ordered in August, 1958, now appears headed for orderly processing by FPC until a decision is made by the full commission.

But again—even though the case is finally underway—its progress is being marked repeatedly by objections and differences in approach by the companies on one side, and FPC's staff on the other.

Clearly, a major court test of the whole issue is looming after the FPC hands down its decision. In fact, the strategy of the power companies' defense is directed toward an appeal to the courts.

A. J. G. Priest (Reid & Priest law firm), representing most of the involved utilities, is maintaining that the utilities must be allowed to justify their contributions to nine public-vs-private power ads in a 1957 ECAP series as reasonable, proper business expenses.

Drexel Journey, FPC staff attorney, is making legal objections that the only testimony relevant to the case—in accordance with a recent opinion from the full commission— is that evidence which relates to the narrow issue of whether the nine questioned ads are political in nature. Journey claims that, if the ads are found to be political in nature, then the electric companies must pay for them out of surplus funds "below the line."

Evidence Not Accepted

By upholding Journey's objections, Examiner March is refusing to accept the evidence of Adm Ben Moreell, Southern Co Pres Harllee Branch, and others.

The full commission ruled in mid-July that testimony in the case must be limited to this "narrow" line of argument, as against the "broad" reach of testimony that Priest charges is necessary to the companies and required by FPC.

Priest, however, emphasized that the utilities be allowed to defend

PRIEST: The rules of the game

ECAP contributions as just and reasonable—the full FPC decision not withstanding—under provisions of paragraph 2-F of the FPC's uniform System of Accounts. "Questioned entries may be justified (under 2-F) by demonstrating that they are just and reasonable," pointed out Priest, "and that is the task we are undertaking".

Priest further criticized the commission's July ruling against the "broad" line of argument because it did not "rely upon the obviously applicable provisions of its own system of accounts." He told Marsh, "We submit, first that those accounting regulations were binding upon us when the questioned entries were made, and are binding upon us now; second, that those accounting regulations were and are binding upon this commission; and third, that they are binding upon you, Mr. Examiner, for the purposes of this hearing."

The FPC staff position is untenable, Priest contends, because it is based only upon an accounting instruction (EA-110) which does not have the effect of law. This instruction deals with contributions to ads for political purposes. On the other hand, Priest pointed out the 76 utilities were basing their argument for "broad" testimony on a Uniform System of Accounts, section that has the force of law.

Priest called a dozen witnesses the first day—but their testimony was ruled inadmissible. They included Adm Ben Moreell (Ret.), Chairman of the Second Hoover Commission's Task Force of Water Resources & Power, and Col. H. S. Bennion, former Edison Electric Institute managing director.

"The respondent utilities are entitled to act according to the rules of the game," Priest charged, and it is "arbitrary and capricious" of FPC "to impose standards on us which do violence to those rules."

Goal Is—Court of Appeals

The pattern of his case appears to be: (1) upon completion of testimony by both sides an examiner's ruling may be waived by both sides, (2) limited oral arguments would be held before the full commission, (3) an adverse ruling can be expected from the full FPC, (4) a plea for a rehearing by the 76 utilities will be turned down. Then comes the forum that Priest is shooting for—the U. S. Court of Appeals.

Although testimony by Priest's witnesses was not placed in the official record of the case, it is being included in an appendix. Moreell's statement included the scope and extent of the federal power complex, subsidization of federal power, promotion of federal power by its own advocates, preference clauses, the "yard-stick" concept, "the obligation of electric utility managements to resist the onslaught of government power, and . . . advertising as a normal means of meeting such government competition."

Bennion's statement included an explanation of various federal power subsidies and programs plus emphasis on the "vilification of the electric utility industry which has required correction in order to preserve the industry's reputation and good will."

Northwest Power Adequate to '64, Says Pearl

Supply to be ample even under adverse conditions, BPA administrator declares. Canadian connection foreseen, coordination of non-federal plants with Columbia system explored

Even under the most adverse conditions, the Pacific Northwest will have all the power it needs at least until the winter of 1964. Under average water conditions all customers of Bonneville Power Administration, including those supplied with interruptible power, can be assured a supply until 1965-66.

These were highlights from BPA Administrator William A. Pearl's remarks to the agency's customers and its regional advisory council Nov. 12 in Seattle.

BPA presently has "power running out of its ears," because of large non-federal plants coming on the line, Pearl said. He added the reminder that a proposed tie line to California offers one possibility for disposal of the surplus.

A preliminary BPA report on the tie line will soon be ready, Pearl indicated, but it must be reviewed by local agencies before presentation to a Senate Interior committee. It will be difficult to meet the Senate's deadline of Dec. 31, he added.

J. L. Morthland, assistant BPA administrator, predicted an early settlement by International Joint Commission of Columbia River power problems involving Canada and the U. S. The commission is reportedly seeking advice on methods by which Canada could build upstream storage projects in return for about half the additional power at downstream U. S. plants.

A connection between the Canadian and Bonneville systems and eventual coordinated operation will be inevitable, Morthland said.

In sessions at Portland, BPA presented preliminary suggestions for coordination of non-federal generating plants or systems with the federal Columbia River power system.

Coordination plans would not exceed 50 years and if sale of energy is involved the term would be limited to 20 years. Contracts with privately owned utilities would provide for withdrawal on five years notice if power is needed by a preference customer, the BPA report said.

Under current government practice, the evaluations of energy and services include these rates: Peaking —$9 per kw year; energy—2.5 mills per kwhr; storage—1 mill per kwhr for energy stored and returned.

ECAP Exhibit Shows Taxpayers' Stake in Federal Power

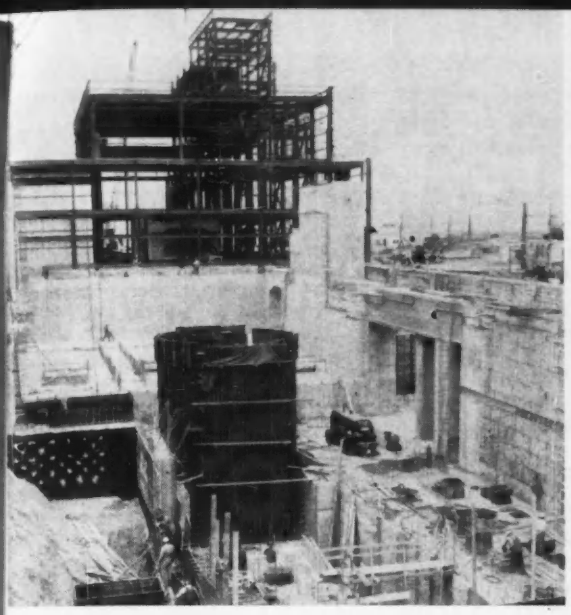
PUSH-BUTTON CONTROL supplies tax answers for individual states, U. S. total

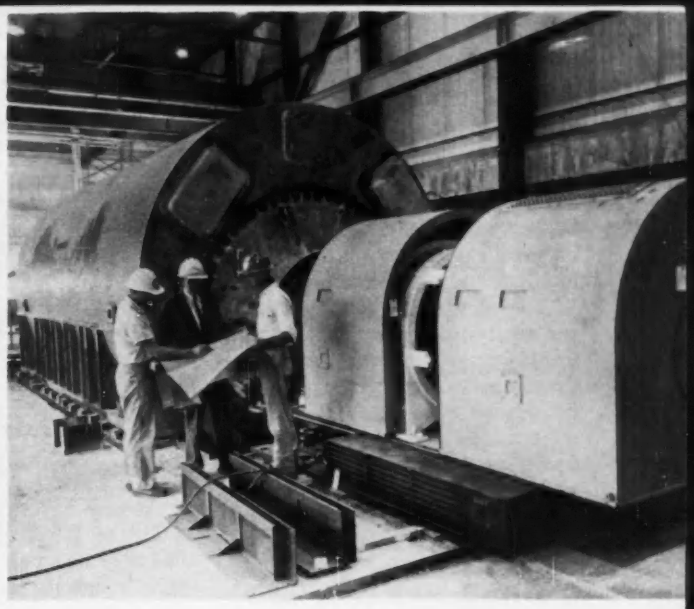
The Electric Companies Information Program has turned to automation in spreading the story of state-by-state taxes already paid for federal power projects. The exhibit, at left, operated by a few of the 10,000 delegates who tried it out at a recent Minneapolis American Legion convention, is being used at national meetings and other public expositions.

The device is operated by a push button opposite each state's name which lights a panel showing individual state amounts. A master push button lights all the panels and flashes a national total of $5.5 billion.

The national figure is based on Federal Power Commission reports on expenditures allocated to federal power through mid-1957. Estimates since that time are based on Edison Electric Institute's figures.

Response to the exhibit has been encouraging, according to N. W. Ayer & Son, Inc, agency for the more than 100 member companies of the ECAP program.





Hallam Gets Core Cavity Liner, Yankee Receives Generator

The steel strike's effects have not hampered construction schedules at the Hallam, Neb., and Rowe, Mass., nuclear power plants, judging from recent construction progress announcements. Installation of the reactor core cavity liner (center, left cut) has been completed for the 75-Mw sodium graphite reactor of Consumers Power District of Nebraska. Atomics International is designer of the reactor, which will be completed in 1962, along with the turbo-generator facilities. Meanwhile at Yankee Atomic Electric Co's 134-Mw station in Rowe, the hydrogen-cooled generator has been installed. On hand for a blueprint check (right cut) are Westinghouse Electric Corp engineers John R. Guilford, Project Manager Richard Bessom, and David McGuire. More than 85% of outside construction of the $50-million plant is completed.

Euratom Chief Is Optimistic

Big future energy requirements, R&D cited as encouraging for six-nation group; McCone and McKinney don't agree

Proof that hope springs eternal was never more obvious than in the spoken words of M. Etienne Hirsch, president of the Euratom Commission, last fortnight at the combined annual conference of the Atomic Industrial Forum and the American Nuclear Society.

Despite authoritative statements made by high level government and industry atomic leaders that Euratom's long-range power reactor construction program was in serious trouble, Hirsch appeared confident.

His convincing tones assured newsmen at a special press conference of the following points:

- Euratom would achieve its goal of 1-million kw installed nuclear capacity by 1963-65.
- There would be no change in Euratom's approach to constructing large scale nuclear powerplants, criticized lately as leaving development of atomic power at the mercy of European utilities;
- European firms were as a whole interested in participating in the Euratom program, but for their benefit more flexibility should be injected into the timetable.

Robert McKinney, New Mexico publisher, recently appointed to review the international policies and program of the U. S. for the Congressional Joint Committee on Atomic Energy, in a keynote address, said his study would look into Euratom's lagging program and recent changes in Europe's conventional fuel resources availibility.

McKinney said of the recent response to proposals submitted to Euratom's invitation, characterized as disappointing, "the results weren't disappointing to those who understood and knew what the situation was there."

Atomic Energy Commission Chairman John McCone was also pessimistic on the Euratom question and said, "I don't think we are going to achieve a million kilowatts by 1963 or 1965."

Apparently Hirsch based most of his optimism on the enormous energy requirements of Euratom's six member countries. Present needs are 230-billion kwhr and requirements are expected to be four times this amount around 1980. According to Hirsch's estimates, one quarter of the last amount will have to be produced by nuclear power.

Hirsch also spoke of the manner in which Euratom's research and development program was contributing to the integration of European science.

AEC Approves Cost Study On Uranium and Plutonium

The Atomic Energy Commission has approved a project long awaited by the atomic energy industry: an independent evaluation of enriched uranium and plutonium costs.

According to reactor manufacturers, utilities have shied away from buying more reactor complexes than they would have if given the basis upon which to calculate overall uranium fuel costs. Both segments of the industry doubt that government-established prices of enriched uranium fuel reflect true cost. They lean to the belief that the costs of uranium, both enriched and natural, are jacked up appreciably by the demand of government for weapons material.

AEC Chairman John A. McCone, however, has said the new study will prove uranium fuel prices are not and never have been subsidized. He was still worried, though, that production and cost figures would give away the U. S. atomic stockpile and other weapons capabilities. His offer consists of letting former AEC employees with "Q" clearance conduct the evaluation on a classified basis under the Atomic Industrial Forum's auspices. The committee's independent conclusions would then be relayed to the industry.

I&M Physical Workers Walk off Their Jobs

Nearly 400 Indiana & Michigan Electric Co physical employees walked off their jobs on Nov. 14 after working nine days without a contract. The workers are represented by District 50, United Mine Workers Local 12530.

The UMW workers has remained on the job without a contract since Nov. 5, when they rejected a company offer which included a 4½% wage increase, three week's vacation after ten years, increased shift premiums, and 19 other contractual concessions. I&M sent letters to all UMW employees stating that the 4½% wage increase had been put into effect retroactive to Nov. 9.

UMW pickets, although orderly, prohibit supervisory employees from entering the company's Twin Branch generating plant at Mishawaka. Supervisory employees have been staying inside the plant, and have kept it operating at normal capacity since Nov. 5.

Federal Mediator Chester Ralston met with both the company and the union on Wednesday, Nov. 18, but no agreement was reached. Negotiations began on Sept. 25, with daily bargaining from Oct. 13 to Nov. 5.

TVA Expands Information Service to Wall Street

A new investment house letter made its debut the middle of this month. It's called "TVA Power News" and is being prepared for the Tennessee Valley Authority by Doremus & Co, a New York City public relations firm, in conjunction with TVA's information office.

The letter will go out about once a month to some 300 individuals in investment houses, banks, and insurance companies. Purpose of the service is to provide information about TVA, now that it's "becoming publicly owned," to investors who may be interested in the purchase of revenue bonds, which TVA has been authorized to sell, a Doremus account executive said.

Repairs Planned for Dam Damaged in Earthquake

Montana Power Co is draining Hebgen Lake, and will make repairs to Hebgen Dam next spring, then fill the reservoir to the extent it can be filled by the high water of 1960. This was announced by Pres. J. E. Corrette, who said the plan is designed for maximum benefit to nearby cabin and resort owners.

The dam was damaged Aug. 17 by an earthquake that tumbled a mountain into Madison River 7 miles downstream. Hebgen Dam damage consisted of breaks in the concrete spillway at the northeast end, some concrete core wall cracks, and perhaps some outlet structure damage at the dam's southwest end.

Corrette's announcement followed completion of the two-month, million-dollar job by the Army Engineers of cutting an 800-ft channel through "Quake Lake" downstream from Hebgen. The channel cut the lake from 79,000 acre-ft to 47,000. The earthslide dam will erode over the years, the engineers said, but the immediate danger of a flash flood has been removed.

Utility Approves Price Offer of Northern States

Directors of Mississippi Valley Public Service Co of Winona, Minn., have approved an offer of $9.2 million made by Northern States Power companies of Minnesota and Wisconsin to buy the Winona utility's business and assets.

The firm provides service to 13,200 customers in Winona and 29 nearby communities, and 600 rural customers in Minnesota and Wisconsin. Its annual revenues are about $2.75 million.

Before the property can be sold, MVPS must pay off and cancel its $3.34-million outstanding bond issue and recall 15,000 shares of $100 par value, 5% preferred stock for $105 a share.

Northern States of Minnesota would then issue 189,668 shares of its common stock, worth about $4.4 million, which would go to MVPS common shareholders at a ratio of 1.65 shares of NSP Minnesota common for each Mississippi Valley Public Service share.

WWP Plans Area Surveys To Aid Industrial Growth

Washington Water Power Co plans to sponsor an area-wide survey to find answers to industrial growth problems in its 26,000-sq mile territory. Simultaneously, it will participate in a national survey to determine what factors influence industries' location decisions, their plans for expansion, and possible objections to the "Inland Empire."

Albert Gruber, WWP economic development engineer, said the area survey will determine what support local manufacturers and processors are getting. "Many of our present small industries can grow, provide new jobs and new opportunities for growth if they are properly supported by local people," he said.

Both studies will be undertaken by a nationally-known survey agency with a local university being invited to assist in the area project, Gruber said.

Computer Gives Economic Loading For Transformer and Secondary

Analysis of pertinent variables will determine if present system is economical, or will show where to make changes

KENNETH W. KLEIN, Distribution Engineer, Transmission & Distribution Engineering Dept, Cleveland Electric Illuminating Co, Cleveland, Ohio

Calculation of distribution transformer and secondary loading using a digital computer opens the way to analysis of pertinent variables that affect economic loading. The computer frees the design engineer from relying primarily on the criterion of thermal loading, which can be an expensive substitute for economic loading. A study by Cleveland Electric Illuminating Co of transformer and secondary loading in which six variables were analyzed showed that the following three points, rather than thermal loading, are controlling factors:

1. Initial loading of a distribution transformer affects the economics to a far greater degree than does final loading.

2. For any transformer loading schedule, 1/0 aluminum secondary is the most economical wire size.

3. Secondary lengths of two or three sections each way from the transformer are the most economical.

Instructions Revised

On the basis of these conclusions, CEI Co has revised its instructions to field men on the design of secondary distribution systems. The revised method is being used on all new installations and replacements. The company sees a substantial cost saving through use of the new procedure.

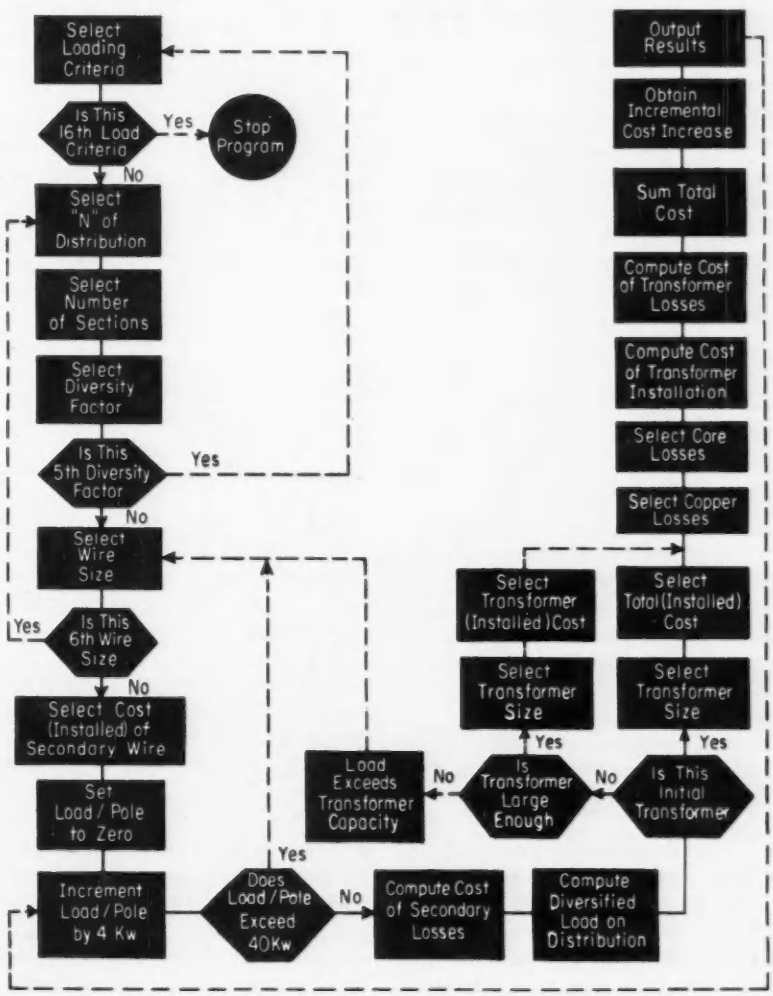
This study included only the transformer plus the secondary wires associated with that transformer, but excluded the service drop. Analyzed in the study were variables that have an effect on annual fixed charges and operating costs.

Annual fixed charges may be lowered by using the lowest cost, yet most practical, method of construction, such as bare wire or standard no-tap transformers. However, before annual operating costs can be analyzed, an accurate study must be made of system losses. Because losses are a large and important factor in operating costs, the cost of losses must be considered carefully, even though there is a temptation to merely estimate the loss factor or equivalent hours of losses. Thus, to lower operating costs, every effort must be made to reduce system losses.

The economic loading study was made on the above basis. It was decided to use the digital computer to increase the number and scope of variables and to provide results of greater reliability. Before a program could be written for the computer, a number of tables were developed which defined the variables and gave specific values to each. These tables were:

1. Transformer loading criteria cov-

How Computer Calculates Loading of Transformer and Secondary



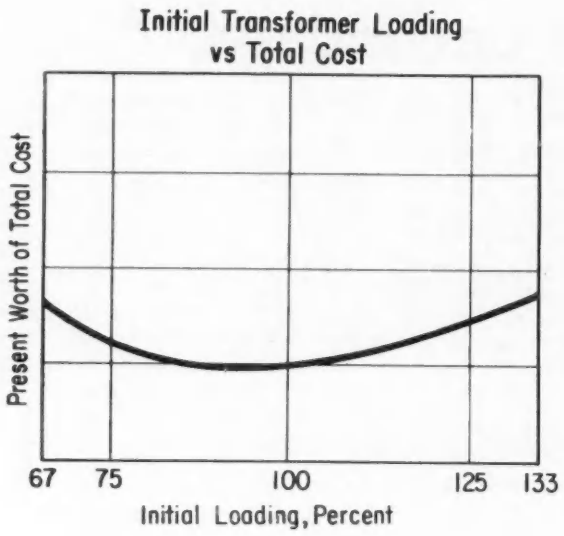


FIG 1—**FIRST TREND TO EMERGE** from calculations by the computer is effect of initial load on total cost. Curve is for four-section 1/0 aluminum secondary with 12 kw per pole

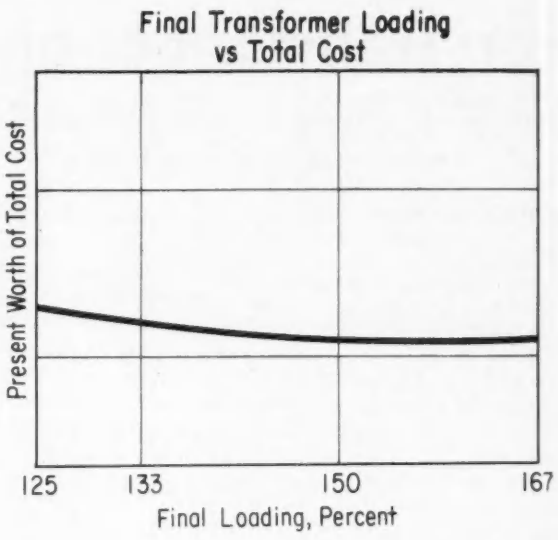


FIG 2—**VERY LITTLE CHANGE** is made in total cost by taking different final loadings on the transformer. This curve is for a 100% load on the system described in Fig 1

ering both initial and final loading limits. For 15 loading criteria, initial loading was varied from 67% to 125% and the final loading from 100% to 167%.

2. Resistance per section of secondary wire (distance between adjacent poles, about 125 ft average) for these wire sizes: No. 4 ACSR; 1/0 aluminum; 1/0 copper; 4/0 aluminum; and 6/0 aluminum.

3. Diversity factors: 0.86 for two sections (12 customers); 0.78 for four (20); 0.73 for six (28); and 0.71 for eight (36).

4. Four secondary lengths: one, two, three, and four sections each way from transformer, or total lengths of two, four, six, and eight sections.

5. Installed cost and losses for transformers in ratings from 10 kva to 167 kva as determined by construction cost analysis.

6. Cost of secondary wire as determined by construction cost analysis.

Losses Converted to Dollars

To reduce manual work, the program was written so the computer calculated and converted transformer and second losses into dollars for all load densities desired. The first task in setting up the program was preparation of a step-by-step sample calculation. From this the data processing group of CEI Co prepared the program in the proper computer language. Throughout the program all costs are converted to dollars per section of secondary distribution, so that a four-section distribution, for example, may be compared directly with a two, six, or eight-section distribution. Steps taken by the computer to calculate the cost data are shown in the flow diagram on the preceeding page.

Interpretation of the computer's output data is handled in several basic steps. First, data coming from the computer are on a kw load basis. For example, if it is assumed that present load is 4 kw per pole, a 5% per year increase will give 8 kw per pole in about 14 years. This same procedure can be used for any load density desired.

The placing of a time or year on each load density aids in bringing all future costs and losses to a present day value. Unless costs and losses for each year are brought back to present value, dollar costs will be misleading. This method is shown in the table. By analyzing these present worth values, minimum cost points consistent with company policy and voltage drop standards may be selected.

Initial Load Is Important

In a study such as this, if various trends and patterns coming from the calculations are consistent, then the results usually are correct. As calculated data pour from the computer and are typed on a summary page, one of the first trends to emerge is the importance of initial transformer loading.

The curve in Fig 1 shows the relation of various initial loadings to present worth of the total cost. There will be a definite minimum cost point at some initial loading. But this does not complete the proof.

The significance of the curve in Fig 2 is to show how very little the various final loadings affect total cost. As there is practically no change from one final loading to another, the minimum cost point must occur only within the limits of the initial loading criterion.

The second definite trend is that of the secondary wire size and length. This is independent of initial loading or final loading of the trans-

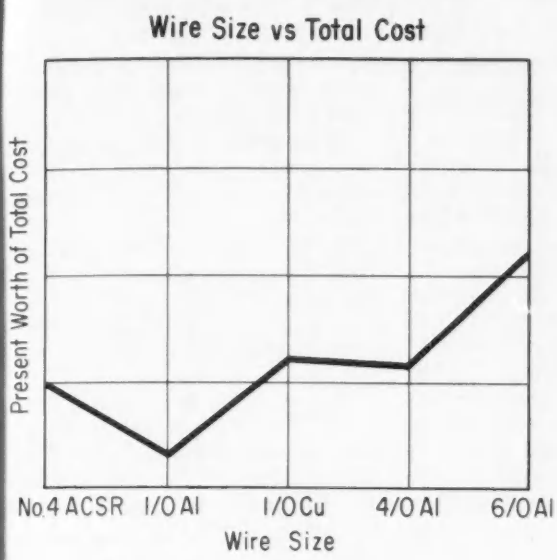


FIG 3—**MINIMUM WIRE COST** is determined for a system consisting of four-section secondaries with 12 kw per pole and an initial loading on the transformer taken at 100%

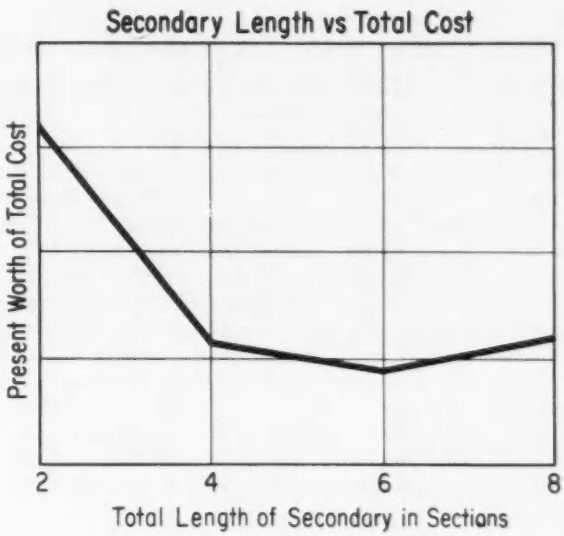


FIG 4—**SIX-SECTION SECONDARY** shows lowest cost for 1/0 aluminum wire, 12 kw per pole, and 100% initial transformer load, but voltage drop may dictate four sections

former, and of the load density. It shows conclusively the advantage of 1/0 aluminum secondary wire (Fig 3) and of 4 and 6-section secondary distributions (Fig 4). Actually the 6-section distribution is the most economical.

However, in many cases the minimum allowable voltage limit may be such that the 6-section distribution will be impractical due to excessive voltage drop. This suggests use of the 4-section secondary, which still is economical and has a much smaller voltage drop.

At this point each individual company must analyze its own policy regarding allowable voltage drop. It is the final loading plus the secondary loadings and size of conductor that determines the lowest voltage obtainable to the last customer on the distribution feeder.

Evaluates Present System

In this type of study, the real criterion of success is whether there is an economic advantage. This study will show whether the present system being used is the most economical. It will also show how much may be saved by using a new loading system.

Annual Worth Plus Annual Losses

(Transformer and Secondary with Four-Section Distribution of 1/0 Aluminum)

Year	Annual Worth plus Annual Losses (per section)	Present Value Factor	Present Value of Annual Worth and Losses (per section)	Σ of Present Worths
0	*$214	1.00	$214	$214
1	217	0.94	204	——
2	221	0.88	194	——
3	225	0.83	187	——
4	229	0.78	179	——
5	233	0.73	170	——
6	237	0.69	164	——
7	241	0.64	154	——
8	245	0.60	147	——
9	249	0.57	142	——
10	253	0.53	134	——
11	257	0.50	128	——
12	261	0.47	123	——
13	265	0.44	117	——
14	*269	0.41	110	2376
15	277	0.39	108	——
16	285	0.37	105	——
17	293	0.34	100	——
18	301	0.32	96	——
19	309	0.30	93	——
20	317	0.28	89	——
21	325	0.27	88	——
22	333	0.25	83	——
23	*340	0.23	78	3207

* Computer values; others are interpolated.

Utilities Offer 230-Kv Plan for

Foreseen new loads and generation guide utilities in proposal to USBR; 345-kv rejected for integrating systems

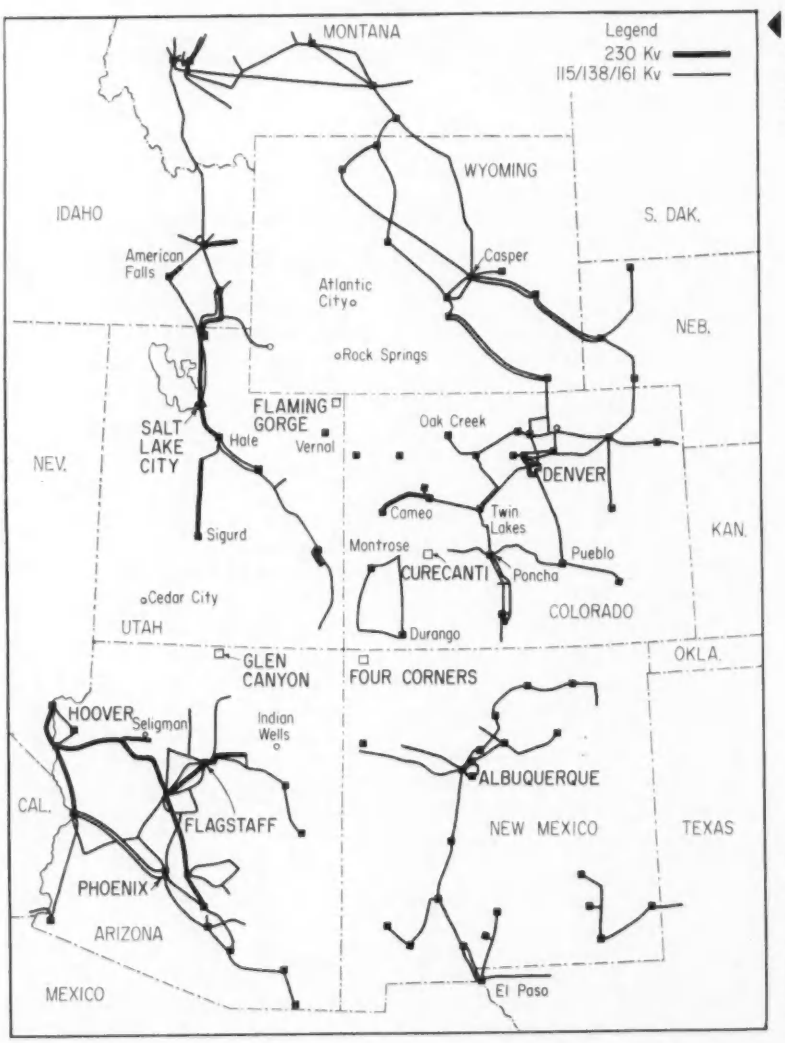
Integration of utility transmission systems in a five-state Rocky Mountain area has been proposed to the U. S. Bureau of Reclamation by five investor-owned utilities. Core of the proposal is a plan for the 20-year joint development of the area's power system by private and federal participants and in circumstances unique in the history of the American power industry. (E.W., Oct. 12, p 88). The proposal, which calls for the construction of multiple 230-kv lines between now and 1975, was initiated by Arizona Public Service Co, Public Service Co of Colorado, Public Service Co of New Mexico, Pacific Power & Light Co, and Utah Power & Light Co.

The scheme envisions facilities for wheeling energy to federal preference (CRSP) customers from the Bureau's Colorado River Storage Project and the integrated operation of CRSP plants with other federal plants and with utility systems in the areas. Principally instrumental in attaining these objectives will be the transmission of power at 230 kv along multiple lines designed to meet these exigencies:

1. Supplying a total load, including preference customers, which is expected to increase by 16 million kw by 1980.

2. Moving power from increasing facilities of the utilities which expect to install at least 16,000 Mw of capacity, an increase of 15 times the total capacity (1,100 Mw) of the authorized CRSP plants.

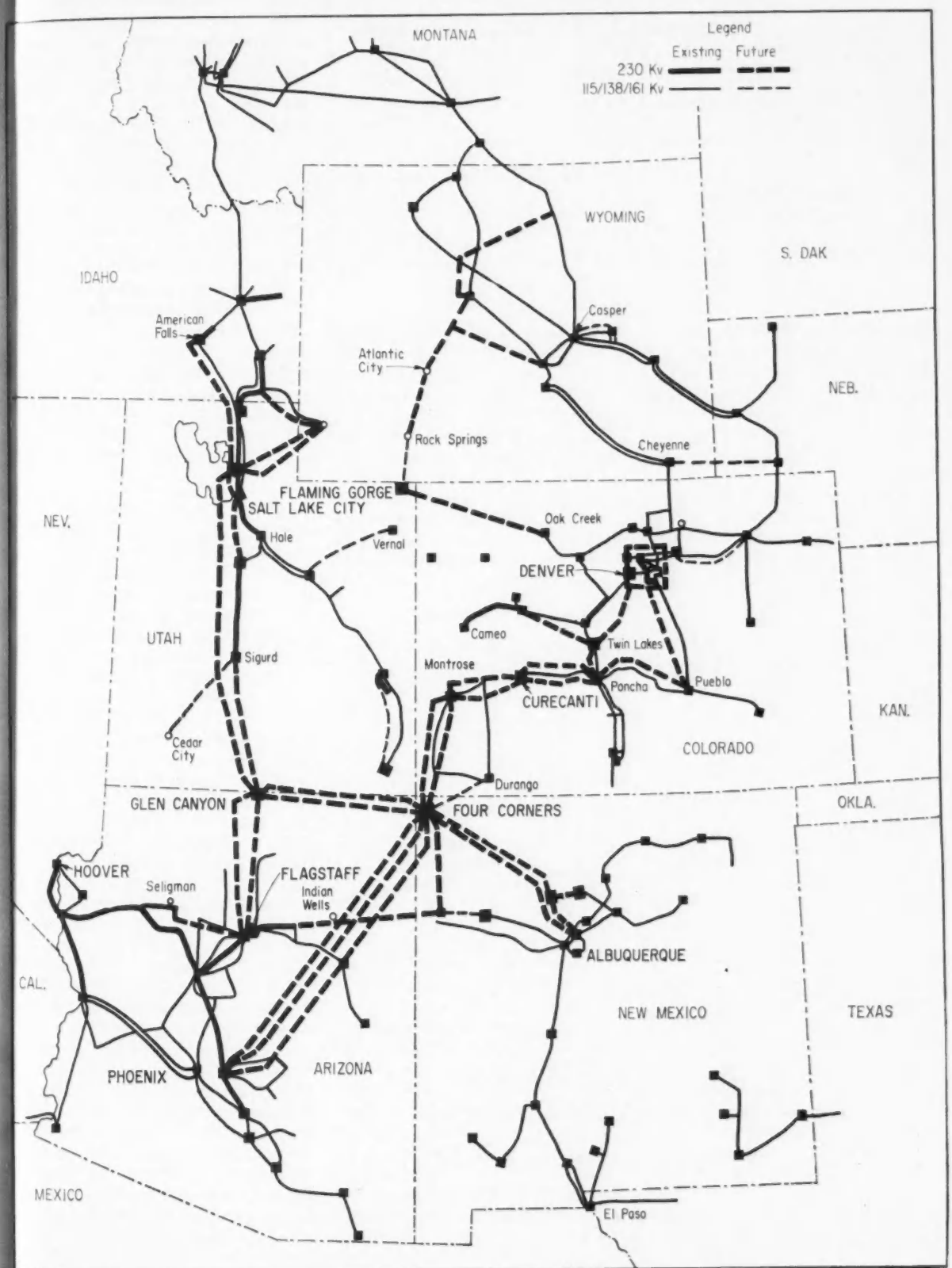
3. Accommodating non-coincident peak loads expected to mount from about 3,900 Mw in 1960 to 20,000 Mw in 1980, terminal date of the scheme. This will be a total



BEFORE plotting in the transmission facilities suggested by the five companies, the five-state area map shows existing circuits 115 kv and above. Not shown are the many 69-kv lines

PROPOSED TRANSMISSION for the Rocky Mountain area would link up USRB and the five-company facilities as shown by the dashed lines, the heavier ones representing 230-kv lines and the lighter ones 115, 138, and 161 kv transmission circuits

Five-State Rocky Mountain Area



Transmission Mileage Requirements of Five-State Plan

Ownership	Circuit Miles
Arizona Public Service Co	320
Pacific Power & Light Co	70
Public Service Co of Colorado	385
Public Service Co of New Mexico	180
Utah Power & Light Co	799
The Western Colorado Power Co	50
Utility Total	1,804
U. S. Bureau of Reclamation	1,105
Total	2,909

load increment of 16,100 Mw.

In the engineering studies supporting the utilities' proposal, consideration was also given a system using single-circuit 345-kv lines. A system using principally multiple 230-kv lines was selected on these grounds:

1. Delivery of large blocks of power over single 345-kv circuits imposes large and uneconomic capacity reserve requirements on the receiving systems.

2. Substantial investment savings accrue through orderly and economic system development as needs increase.

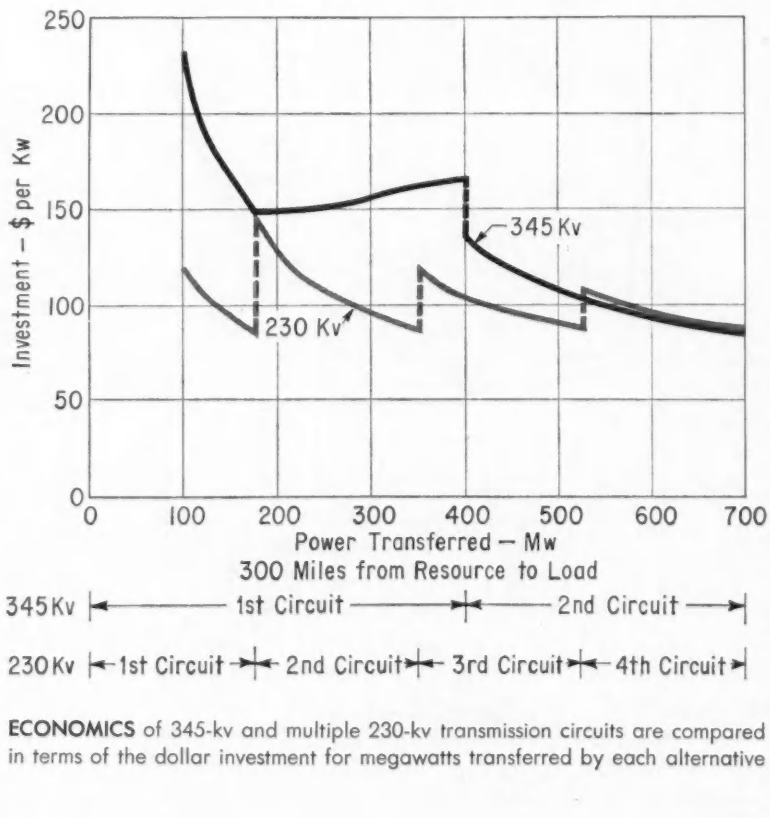
3. The proposed system has greater flexibility for step-by-step additions or for changes in plans.

4. Tapping of transmission circuits for serving small intermediate loads is more economical at 230 kv.

5. Multiple lines provide greater reliability in the delivery of power.

6. Stability of multiple 230-kv ties is much superior to that of single-circuit 345-kv ties. Loss of a heavily-loaded single 345-kv circuit would severely affect the receiving systems, causing ties to other interconnected systems to open with consequent loss of service to some customers. Loss of one of two 230-kv circuits can be tolerated.

7. Problems of corona at the higher altitudes can be coped with successfully on 230-kv lines.



ECONOMICS of 345-kv and multiple 230-kv transmission circuits are compared in terms of the dollar investment for megawatts transferred by each alternative

CRSP Plant Capabilities

Here are the estimated capabilities of CRSP plants in various stages of development:

Plant	1965	1967	1970
Glen Canyon-Mw	550	675	900
Flaming Gorge-Mw	100	100	100
Curecanti-Mw	...	...	100
Total-Mw	650	775	1,100

The final stage of the proposed system will enable the transmission of CRSP power compatibly with tentative allocations of the Bureau. In initial stages, the proposed transmission system affords latitude in the disposition of available power.

The first transmission phase, although installed before initial operation of CRSP plants, consists of lines which later will become principal circuits for transmitting power from CRSP plants. It will include a 230-kv line from Salt Lake City to Flagstaff interconnecting systems of Utah Power & Light Co and Arizona Public Service Co, and passing near the Glen Canyon Project.

The second phase, needed when the CRSP plants begin power production, will transmit the generation of 100 Mw of Flaming Gorge and 550 Mw of Glen Canyon.

The third phase will be necessary when full CRSP generation is attained, including 100 Mw of generation at Curecanti. Hence, an alternative connection to the Glen Canyon-Four Corners transmission link from Glen Canyon to Indian Wells should be considered. Most of the investment for the 345-kv alternative would occur during the second phase of the proposed plan.

In developing the 230-kv trans-

mission system, performance criteria were established for each transmission link. These criteria are:

1. The block of power delivered by a circuit should not impose a large and uneconomic reserve capacity requirement on the receiving system.

2. Each circuit shall be stable for reclosure after a fault clears; loss of any circuit shall not cause instability of other circuits; and, rejection of load at a generating station, resulting from loss of any heavily loaded circuit, shall not render that generating station unstable.

3. In considering step-by-step the capacity needed or useful in a particular transmission channel, account shall be taken not only of the probable range of flow of CRSP power, but also of interchange flows which may be superimposed and of probable load swings under conditions of interconnected operation with other power systems.

4. In selecting a line route and line voltage, consideration shall be given to feasibility of tapping for intermediate loads.

5. Each transmission line shall be designed to provide continuing future usefulness and be compatible with long-term network requirements.

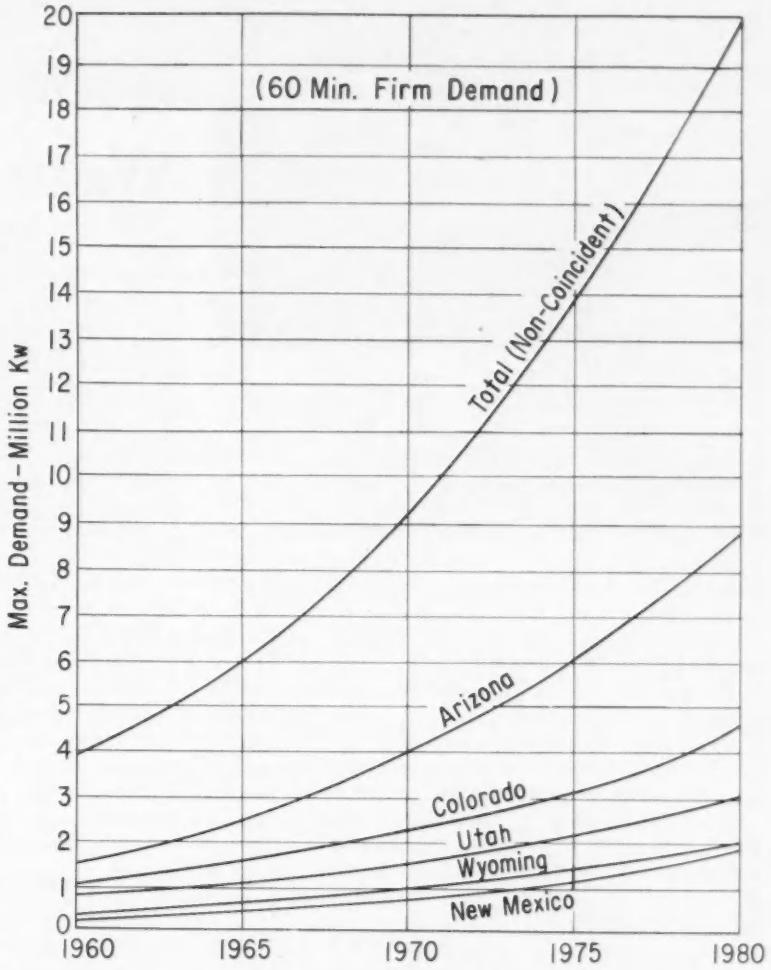
Why 345-Kv Was Rejected

A choice between 230 and 345-kv circuits is usually a matter of overall system design, the cost of the transmission line being only one important factor. Cost of the line per kw is generally less for higher voltages. The per-kw cost of conductor, usually the largest component, is reduced, even though structure and insulation costs per mile go up. Yet the cost of the line, without associated terminal equipment, is not a sure guide.

The utilities selected the voltage with a view to providing general-purpose circuits, which sooner or later would become elements of a comprehensive power transmission network serving all power loads in the area. They preferred this standpoint to the more limited one of merely transmitting a specific amount of power between two fixed terminal locations.

As an operating voltage, 345 kv has inherent advantages for long, heavily loaded circuits. For somewhat shorter distances, it has advantages when power to be transmitted justifies two or more parallel 345-kv circuits. For the situation under study, the amount of power to be transmitted over any one route and the distances involved, without important tap-offs, didn't warrant 345 kv for the principal transmission outlet circuits from Glen Canyon Station.

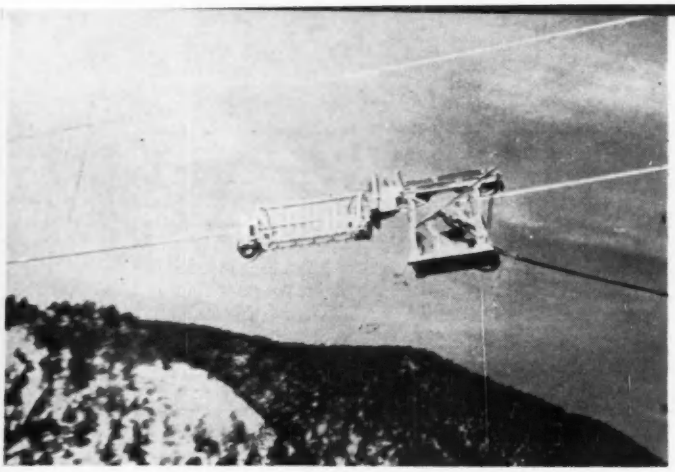
A single 345-kv line on any of the routes from Glen Canyon to Salt Lake, Glen Canyon to Flagstaff, or Four Corners to Poncha was considered by the planners to impose heavy and uneconomical requirements for reserve generating capacity upon the systems in the receiving areas. The reserve generating capacities required to protect customers' service during the outage of individual 230-kv lines on these routes are commensurate with reserves carried in the receiving areas.



ESTIMATED TOTAL LOADS by states include New Mexico's for the northwestern portion of the state, Utah's for that state as well as part of Idaho and Wyoming

To Construct in Stages

Two circuits at 230 kv are less expensive to construct and terminate, and their construction allows the system to be planned and built in segments as loads develop and added generation is installed at power sites. Thus capital expenditures can be spread over periods during which revenues from the sale of power are growing.



Neon Lights Warn Off Planes

NEON LIGHTS spaced on transmission-line spans across rivers alert airplane pilots who often resort to following rivers when fog diminishes visibility

HOMER J. DANA, Professor, Washington State Institute of Technology, Pullman, Wash.

New neon lights give warning of transmission lines to airplane pilots using rivers for guidance in foggy weather.

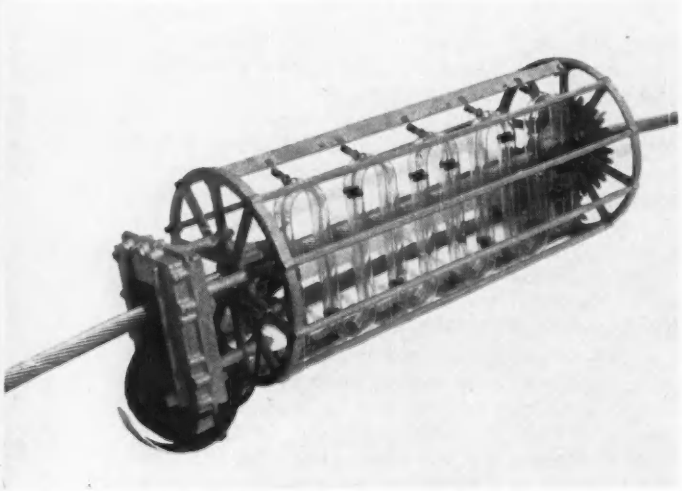
Such lights have been installed at Columbia and Mississippi River crossings, and similar installations are planned by utilities for spanning Eastern rivers.

The new lights were developed by a project in which Bonneville Power Administration and Washington State College cooperated. Strung at intervals along cables over a river, they proved more effective than incandescent lights on towers painted white and orange flanking the crossing. When visibility is poor, a pilot might see the lighted towers without glimpsing the cables.

Units Weigh Less Than 50 lb.

Each self-contained lighting unit is less than 50 lb and has two neon gas tubes in parallel connected to a series transformer and assembled in a supporting aluminum cage. The latter rides concentrically on the conductor. The gas tube is about ⅝ in. in dia and 9 ft long and is folded into a grid to present an illuminated area of 2 sq ft.

The 80,000-hr life expectancy gives the gas tube an advantage over a filament-type lamp, and the red color emitted by the neon gas is universally accepted as a warning. Operating potential is about 1,800 v ac, the energized tube going dark near the end of each half cycle and re-igniting after the beginning of the next half cycle. As two tubes rarely ignite at the same voltage, the one requiring less voltage lights on each half cycle, the other remaining inactive. When the first tube is damaged or deteriorated, the second operates automatically.



EACH HAZARD UNIT consists of two neon gas tubes, which glow red, assembled in supporting aluminum cage which rides concentrically on power-line conductor

Series Transformer Supplies Lamps

Energy for the lamps comes from the series transformer through electromagnetic coupling to the conductor, normal line load remaining undisturbed. Several low-ratio transformers can be connected in series to operate the neon tubes on lines sometimes carrying a very low current.

A booster winding provides adequate igniting voltage and tube current for illumination under lowline-current conditions.

Several methods of installation are practicable, all requiring that the line be de-energized. The simplest is lowering the cable catenary until it can be reached from the ground or from a boat. The light may also be mounted loosely on the conductor at a tower while a man in a cable buggy pushes it into position. The third method is used for both installing and retrieving; it uses a remote-controlled motor-driven trolley. A light is placed loosely on the conductor at the tower end, and the trolley is coupled behind it with traction wheels engaging the conductor.

Power for operating the trolley is supplied from a gas generator on the ground through a control panel over a long 3-wire control cable which extends over a pulley at the tower to the trolley. Controlled by an operator at the panel, the trolley pushes the light into position on the span, locks it to the conductor, and returns.

A motor-driven four position switch on the trolley enables the operator to select any of four operations.

Baseboard heaters in offices and . . .

overhead units in production areas . . .

Keep All-Electric Plastics Plant Clean, Warm

Cleanliness, economy, and efficiency were the deciding factors in Chippewa Plastics, Inc's selection of electric space heating for their new 42,000-sq ft headquarters and production facilities in Chippewa Falls, Wis. The all-electric plant has 246 kw of electric space heating, including 76 kw of baseboard heating in the offices, 120 kw of overhead units in the plant, and a 50-kw electric heating unit which warms fresh air drawn into the plant ventilating system.

In the manufacture of high quality plastics, cleanliness is very important. And electric heat, with no soot, dust, or dirt, is the cleanest heat known. Initial cost of the electric heating units and their installation cost were both lower than for an equivalent fuel-fired system. In addition, the 730-kw load needed for the plant's plastics production pointed to electric heat as the most efficient and economical method of heating the plant.

The entire plastics operation in the new plant is based on electric power. For example, electric heating equipment on the plastic extruders totals 394 kw, motor load is 518 hp, and approximately 45 kw is used for lighting. In addition, the plant has a 5-kw welder.

Matching the modern production facilities and heating are the other building services. All offices are completely air conditioned. The air ventilating system completely changes the air in the plant every 12 minutes.

The plant ventilating system serves two purposes. In summer, it exhausts heat produced by the plastic extruders. In winter, it shoots warm air from the extruder area into the fresh air ducts to supplement the electric space heating.

Modern power distribution includes a 1,000 kva unit substation. The 3-phase, 240-v wiring for heavier machinery is housed in bus duct which can be easily moved when machinery is relocated. The 120/240-v single-phase system for smaller equipment uses long runs of trolley duct so equipment can be connected to any point along the duct.

Modern Dairy Has 150-Foot-Candle Lighting

R. D. BEST, Senior Industrial Sales Representative, Ohio Edison Co, Akron, Ohio

Modern lighting and modern accounting equipment go hand in hand at the Lawson Milk Co, Cuyahoga Falls, Ohio. This ideal installation has 150 foot-candles of illumination. A one-hp air conditioner assures employee comfort. As a result of the excellent working conditions, employees can work with maximum of efficiency and a minimum of error – a very important consideration in this type of work.

Bright, modern areas like this replace . . .

underlit shops like this as . . .

New Lighting Brings Machine Shop Business

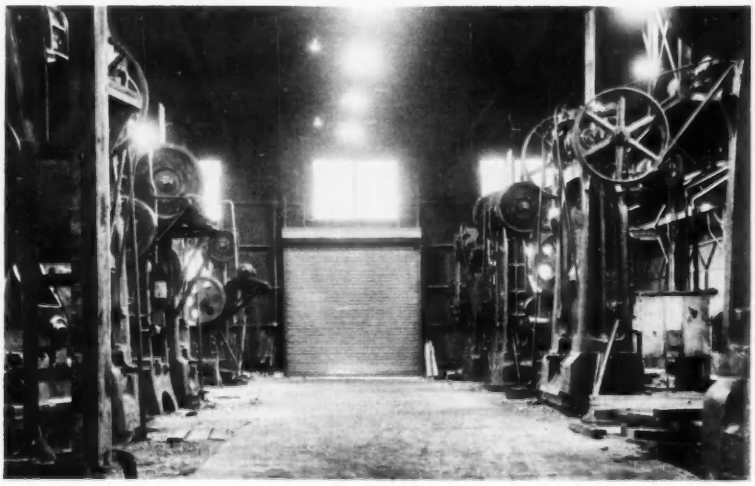
J. V. WAITKUS, Industrial Power Representative, Baltimore Gas & Electric Co, Baltimore, Md

A new lighting installation at the Service Machine Co, Baltimore, Md, clearly demonstrates the dollars and cents values of good lighting. The company felt that existing inadequate illumination was a drawback to business growth. Lighting seemed to create an unfavorable impression on prospective customers, neutralizing the advantage of showing a fine array of precision tools.

To test this theory, one area of the shop was relighted. The result – new orders have kept the shop so busy that it is working at full capacity. In addition, there has been a surprising improvement in the attitude and morale of the machinists, who now work faster and more accurately. Plans are now underway to relight the other section of the shop and to extend the benefits already obtained by relighting the first section.

50-Ft-C Lighting Eases Forge Shop Inspection

RALPH O. SMITH, Industrial Sales Engineer, Connecticut Light & Power Co, Meriden, Conn

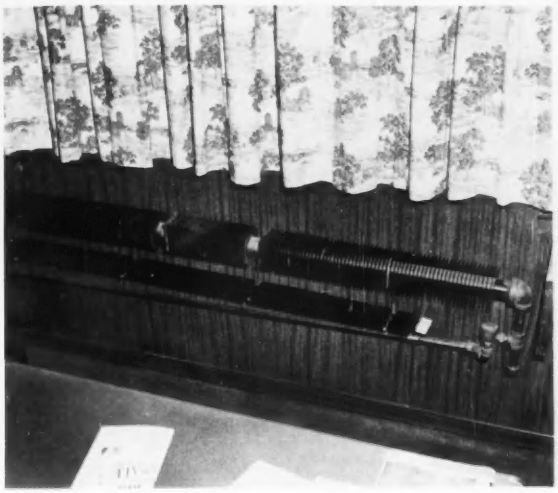


A new lighting installation in the forge shop at Ideal Forging Corporation, Meriden, Conn, proves that properly designed lighting can cope with any illumination problem. Because walls, floors, and equipment surfaces are hard to keep clean in a forge shop, reflectance is low and lighting conditions often poor. But this didn't stop Ideal.

The main lighting source in the 50 x 70-ft shop is eighteen 400-watt color-corrected mercury lamps, installed in wide distribution, ventilated housings with shock absorbing fittings. For safety lighting and incidental night lighting, one row of five 200-watt incandescent reflector lamps are mounted in the center of the shop.

Lighting level in the working plane is 50 foot-candles, which meets the new lighting standards. Work is done more efficiently and safely. Inspectors can see what they are looking for – faster. The improvement in morale is reflected by the men's claim that their forge shop is the best in the country.

Auxiliary Office Heaters Obviate Boiler Startup



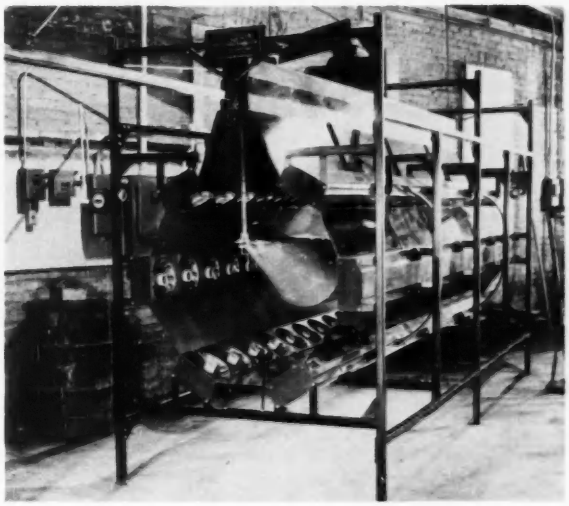
H. E. BAMBERGER, Commercial Sales Representative,
Ohio Power Co, Canton, Ohio

Auxiliary electric heaters installed in the executive offices of an Ohio sheet and ornamental iron fabricator provide clean, efficient and economical heating during the spring and fall months. The heaters, at the A. G. Stafford Co, in Canton, Ohio make it unnecessary to start up the boilers until heating is needed for the rest of the plant. The installation consists of a 2-kw fin strip heater hung below the steam convector in each office. When the cover is in place, the heater is hidden, providing a neat installation. Each heater is controlled by a separate thermostat. The auxiliary heating is proving to be very satisfactory, since the company can set the thermostat in each office and forget about starting up the boiler in the spring and fall months.

I-R Oven Solves Pontoon Paint Drying Problem

A 62-kw infra-red drying oven proved to be the solution to a difficult paint drying problem in the manufacture of steel pontoons at the Red Cross Mfg Co in Bluffton, Ind. Made of low alloy steel, the pontoons are used on the Parti-Barge, a pleasure craft for lakes and rivers. The air-dried finish used on early models deteriorated under the chemical action of sun and water to which it was exposed. Although a wide variety of air-dried finishes was tried, none was successful.

The solution was to bake a two coat epoxy marine enamel finish on the acid-cleaned pontoons at a high, rigidly controlled temperature. The driQuik ceramic oven, approximately the same length as the pontoon, has infra-red sections spaced at intervals around the products to provide an even bake with a minimum of heating units. A push-pull conveyor moves the pontoons in and out of the baking area. A cyclical timer permits the operator to dial the exact temperature needed or change the temperature quickly for other products.



What's Your Production Problem?

If you have problems in lighting, drying, casting, forging, painting, or materials handling, consult your local power company. Let their experienced specialists show you how to cut costs with electric power.

Keeping customers' cars warm with . . .

500-watt electric heaters makes . . .

Drive-In Year Round Money Maker

ARTHUR A. BOND, Power Sales Engineer, United Illuminating Co, Bridgeport, Conn

A decision to install 500 electric heaters for customers' cars at the Twin Drive-In Theatre, Bridgeport, Conn, is enabling the owners to earn income on their investment all year round. With the 750-watt heaters, which can be set right in the car, the drive-in is now open right through the winter, with near capacity crowds on weekend nights. Studies made since they were placed in service last January show that heating cost is about 6 cents a car for a regular performance and 7.5 cents when two top pictures are run on one bill.

Since Bridgeport is in a 6,000-degree-day area, some type of heating was needed for winter nights. Studies showed that electric heat was the answer for several reasons:

1. The heaters hang on the same post as the speaker and are therefore readily accessible;

2. The heater is fixed on the post in winter, but can be easily removed and stored in summer;

3. It is the only way of providing circulating heat for the occupants' comfort. With circulating heat, windows do not steam up, regardless of outside temperature;

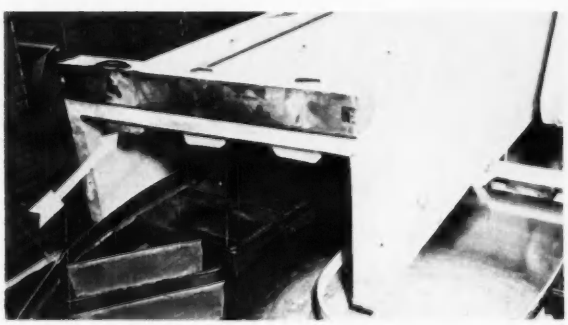
4. A portable heater would have to be dispensed from a booth and would require a deposit and attendants.

The heaters are supplied by four 400-amp switches on the rear of the refreshment stand and adjacent to three 100-kva transformers.

I-R Heat Speeds Processing, Improves Quality

PETER GROSS, Industrial Power Representative, Pennsylvania Power & Light Co, Bloomsburg, Pa

Preheating bread pans with infra-red heat has proven to have a three-fold advantage for the Williamsport, Pa., plant of the Capital Bakers. With the 7.5-kw installation, the dough flows more uniformly into the pan. Proof box time is reduced, which automatically improves the quality of the product. And there are substantial savings in proof box heat. The unit consists of three 2.5-kw heaters with built-in reflectors enclosed in sheet metal.



Introducing a NEW Concept In Power Transformers

Expanded Preferred Design Program

Includes: AN ATTACK ON INFLATION
SUPERIOR FEATURES
ADDITIONAL RATINGS

GENERAL ELECTRIC

Progress that Pays Off

NEW Preferred Design

Achieving an Industry Goal . . . A Better, More Economical Transformer

J. W. SEAMAN, General Manager — Power Transformer Department General Electric Co.

My associates and I would like to discuss a revolution in power transformer design and manufacture. A revolution that can help electric utilities meet the pressing challenge of inflation and, at the same time, provide improved units.

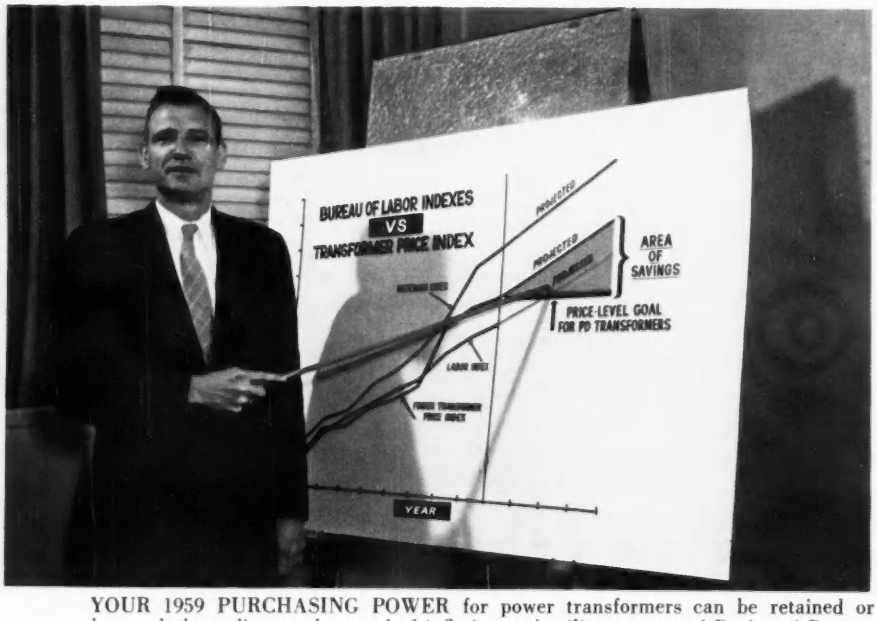
In 1957, we took the first step in meeting this challenge by introducing Preferred Design transformers — units with uniform features and accessories but complete electrical flexibility. Now all the people and facilities at our Pittsfield, Massachusetts power transformer plant are involved in a sweeping expansion of the original PD concept.

This new PD program meets the tests of a valid new business approach for power transformers: It is a strong force to combat the continuing inflationary trend; it incorporates user-preferred features; it embodies extreme product simplification while providing for continual product progress.

Uniformity of design and manufacture is basic in the Preferred Design program. Manufacturing economies will result from the conversion of our factory from a job shop to a mechanized production facility. Since these economies will be passed on to utilities, the program warrants the consideration and support of the electric utility industry.

Now my associates will outline our expanded Preferred Design program in more detail . . .

". . . net published prices should remain near present levels . . ."



YOUR 1959 PURCHASING POWER for power transformers can be retained or bettered, depending on the trend of inflation and utility support of Preferred Design.

C. T. KASTNER, Manager — Marketing

In spite of continually rising labor and material costs, we haven't increased our published prices since mid-1957. And if the electric utility industry provides volume support for the PD program and inflation continues at the current rate, our net published prices should remain near their present levels for at least the next several years.

More immediately, based on acceptance of PD to date, we have realigned our pricing structure because our new manufacturing system obsoletes many previous price relationships. While there are some increases, the majority of net published prices have been decreased. Considering the entire Preferred Design line, a more-than-five percent downward adjustment is now in effect.

GENERAL ELECTRIC

Valuable Hedge Against Inflation

*"... substations built or uprated ...
faster, more simply and economically."*

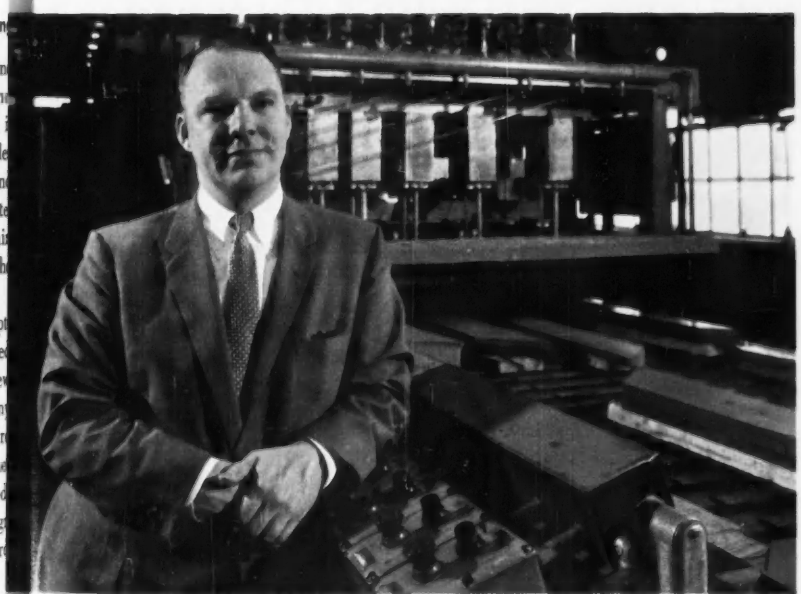
SIMPLE, ECONOMICAL UPRATING results because *all* General Electric Preferred Design power transformers can be fitted with U-connectors and radiators for light loading or uprated to maximum capacity through addition of fans and pumps.

L. WETHERILL, Manager—Engineering

Utility engineering and operating personnel will find many PD assists when substations are built or uprated. The advantages of "construction-approved" proposition drawings, uniform mechanical features and accessories, 40 percent faster deliveries, optimum designs and the ability to uprate new PD units mean substation work can be done faster, more simply and economically.

Previously, the choice of cooling method entered into a particular unit's design. No more. Now cooling is relegated to its proper place as an accessory. PD transformers will accept any of the interchangeable cooling packages. For example, when serving a growing load, the capacity of every OA// unit can be increased 67 percent with only about five percent added investment.

*"... cost-saving steps toward mechanization
paralleled by product improvements."*



CONTINUOUS ANNEALING OF CORE STEEL has helped make PD unit more efficient; typifies Preferred Design emphasis on better methods for better quality.

P. H. ALSPACH, Manager — Manufacturing

The uniform shape and arrangement of PD components permits greater use of mechanization, sub-assembly work and repetitive manufacturing operations. We are converting from an in-series job shop operation to parallel manufacturing in product-oriented production areas. One example: the new cooling concept has helped the development of one basic tank which only now can be assembled on a single, efficient line, independent of other components.

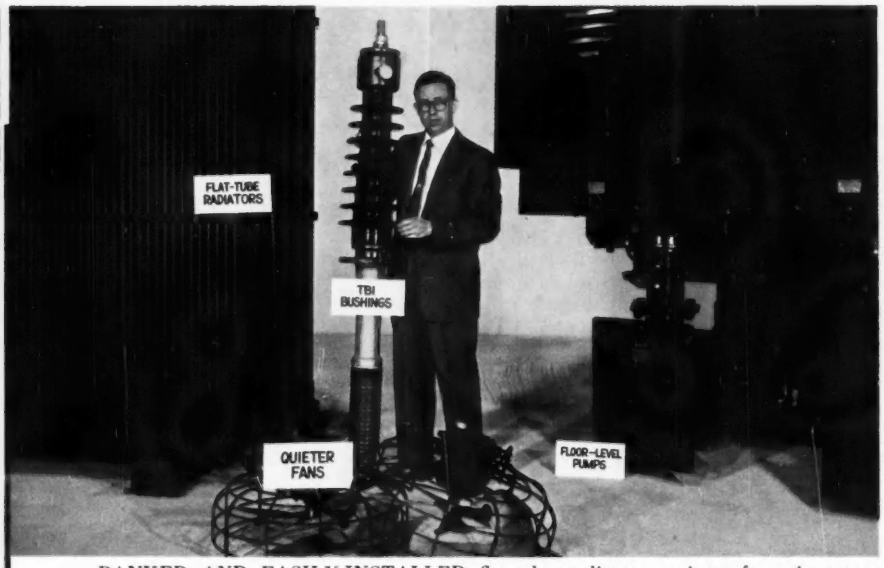
This is our key to holding the line on prices. At the same time, methods have been adopted to improve quality and shorten time cycles. Result of these manufacturing advances: cost-saving steps toward mechanization paralleled by product improvements.

GENERAL ELECTRIC

Progress that Pays Off

More Ways NEW Preferred Design will benefit electric utilities . . .

". . . many previously optional features . . . automatically supplied without charge."



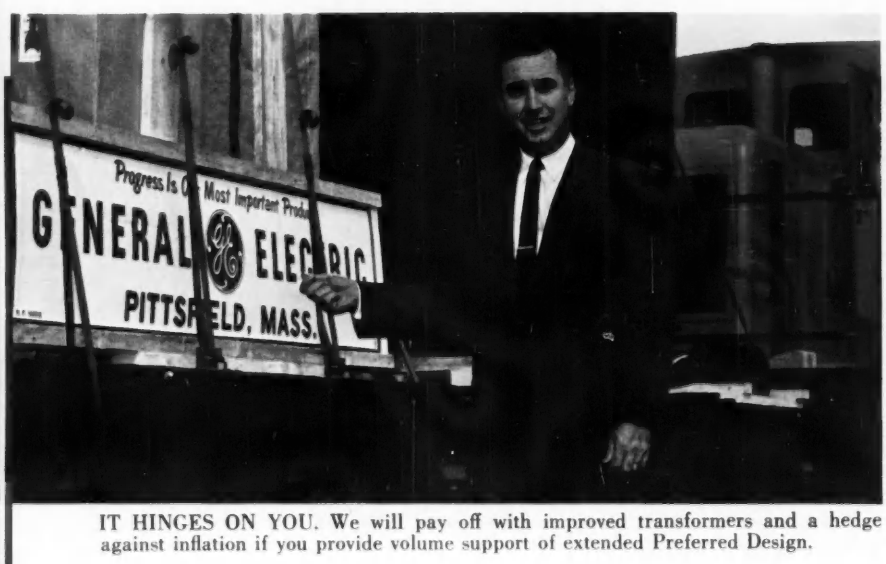
BANKED AND EASILY-INSTALLED flat-tube radiators, quieter fans, inventory reducing TBI* bushings and more accessible floor-level pumps typify the many new Preferred Design transformer features. *Trademark of the General Electric Co.

L. H. HILL, Product Planning Enginee

Preferred Design transformers reflect th needs and desires of the large majorit of utilities as best we could determin them. Through surveys, interviews an analysis of orders and specifications, th uniform features and accessories whic were chosen are truly utility-preferre

To further product uniformity, man previously optional features are no automatically supplied without charg These include provision for lightnin arresters, additional CT's and protecti relays. The ability to uprate a unit is no inherent in each PD unit — for example on an OA unit we supply conduit fo future use and TBI bushings suitable f the maximum rating. Our criteria is t provide as standard any item needed f later uprating which is more easily i stalled in our factory than in the fiel

Given necessary support . . . "We are ready to pay off . . ."



IT HINGES ON YOU. We will pay off with improved transformers and a hedge against inflation if you provide volume support of extended Preferred Design.

C. B. FAUBION, Manager — Power Transformer Sales

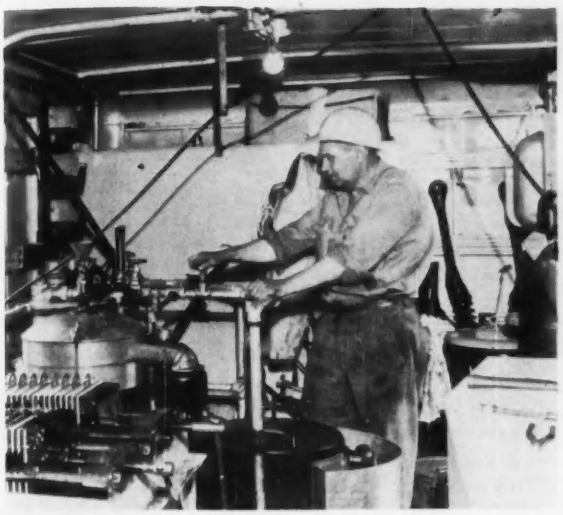
Preferred Design is a major example progress in power transformers tha pays off.

In the expanded PD program, we offe superior transformers, faster deliveries and time- and money-saving benefits i your planning, engineering, and operat ing work. On top of this, we want t help you fight inflation. We are read to pay off if you accept the industry preferred features and provide th volume support we need.

For a more complete story, contac your G-E Apparatus Sales Office or re quest GEA-6604 from General Electri Co., Section 421-59, Schenectady 5, N. Y

Progress Is Our Most Important Product

GENERAL ELECTRIC



FILTER-PRESS EQUIPMENT for insulating oil maintenance program is installed in truck body designed for this service

POWER FOR UNIT is supplied by connection from substation to the hinged fused support mounted over the cab

Filter-Press Units Have Nine Improvements

CARL TAKLE, Electrical Engineer, Wisconsin Power & Light Co, Madison, Wisconsin

Worn-out equipment recently prompted Wisconsin Power & Light Co to buy two new filter-press trucks for the maintenance of insulating oil in large power transformers and oil circuit breakers. Many improvements were incorporated in the new equipment to increase its capacity, make the maintenance of oil easier and to tailor the equipment to the requirements of today's system. Nine of the improvements were:

1. Truck bodies are Premier Custom Models especially designed to meet the needs of filter-press equipment.
2. Facilities for power connections were improved. Transformers rated 25 kva, 7,200/12,400 kv—120/240 v are equipped with an externally-operated, high-voltage, series-multiple switch.
3. High-side fuse protection was improved.
4. Equipment and tools are arranged inside the truck for greater ease.
5. More hose capacity was provided and the arrangement for handling hoses is more convenient.
6. Oil-storage capacity was increased from 30 gal to 300 gal.
7. Boxes for tools and accessories were moved inside.
8. More convenience outlets and outlets for 120/240-v supply were provided.
9. Oil flow may be controlled remotely.

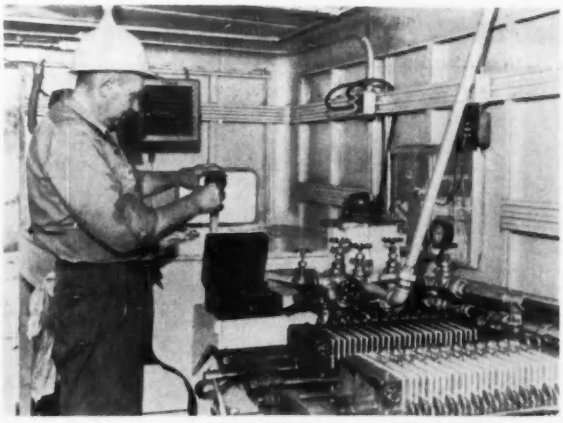
The new trucks of cab-over-engine design are equipped with 8.25x20 tires. The truck body of welded steel is 16 ft long, 7 ft 11½ in. wide and 6 ft 8¾ in. high, with an over-all height of 10 ft 6 in. Flooring is oak hard wood laid over a ¾-in. plywood lining.

There are three doors: an entrance door with step at the rear and an escape door on each side. The rear step folds under the body when not in use. All door latches are of the locking type, with outside and inside handles to prevent the operator from being trapped inside the van. Windows in the doors are crank controlled. There also are four stationary windows, one in each side and two in the rear of the van.

To conserve space, two Hannay Model EP-34-22-23, 120-v, single-phase, ac, explosion-proof, electric top-rewind hose reels were installed on the new trucks. These reels have a capacity of 120 ft of 1¼-in. hose. Reels are arranged so that a 30x30-in. hinged section on the right rear side of the body provides space for handling hoses and replacing filters. There is convenient space for cork storage above the hose reels.

Following an investigation of oil purifying equipment of other utilities, the centrifugal oil purifiers that had been in service on the old trucks were transferred to the new trucks. The 8x8-in. filter presses that had been in use also were transferred to the new trucks.

The new trucks have 300-gal oil storage tanks installed inside. These tanks take the place of 30-gal outdoor underslung tanks used on the old trucks. The larger tanks eliminate the transporting of oil barrels formerly used during the filtering of oil and inspection of circuit breakers up to and including 69-kv ratings.



WORKING ARRANGEMENT inside the truck was planned to promote neatness and put equipment in easy reach

CONTROL CENTER feeds many pieces of equipment from 25-kva, 7.2/2.4-kv—120/240-v transformer on the truck

For larger equipment a 6,000-gal semi-tank-trailer is used for handling oil.

Transformers for the new trucks are equipped with special bases suitable for bolting directly to the truck floors. The low-voltage side of the transformer is connected to the bottom side of a 200-amp, 240-v, nonfusible dpdt switch. The top of this switch is connected to a 100-amp, 240-v, three-wire, three-pole receptacle located outside at the rear of the van.

Thermostatically-controlled oil heaters are interlocked with the oil pumps through a 90-amp, 220-v general-purpose magnetic contactor. The operating coil of the contactor is connected through two three-way switches. One of these is on the control board inside the truck van. The other is connected to a 100-ft cord for remote control of oil flow and level.

To make it easier to establish a primary connection to the 25-kva transformer on the filter truck, all new distribution substations on the Wisconsin Power & Light Co system will be equipped with one disconnecting switch for that purpose. This switch will be connected to the line side of an oil circuit breaker.

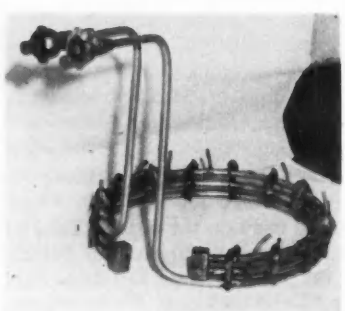
Because of these arrangements in the substations, fuses were installed on the rear of the truck cab. These fuses have a hinged support to provide the necessary vertical clearance. A ¼-in. aeroplane cable is available for connection from the hinged support to the substation.

The oil purifier has a rated capacity of 600 gph when operated in series with the filter press and 900 gph when operated without the filter press. With both the filter press and the centrifuge by-passed and with each pump operated separately through individual suction and pressure lines, the capacity is 1,700 gph.

Several months of experience in the field indicates that the new trucks and filtering equipment will prove highly satisfactory and will be a great improvement over the equipment used in the past.

Auxiliary Coil Cools Air Heater Bearings

A. J. DeSTAFANO, Plant Hagood, South Carolina Electric & Gas Co, Charleston, S. C.



An auxiliary cooling coil for the air heater eliminates load drops at Plant Hagood of South Carolina Electric and Gas Co. Should the main cooling oil circulating system for the air heater support bearings go out of service, the auxiliary cooling coil is dropped into the housing. Water from the plant service system is circulated through the coil, which surrounds the support bearing.

The coil was designed and fabricated by Plant Hagood maintenance personnel. It consists of three pieces of ⅜-in. ID, type 304 stainless steel tubing bent into circle segments of the proper diameter and of about 330 deg of arc. Both ends of the tubing are fitted into 180-deg return brass blocks to make a three-pass coil. Tubes for the top and bottom turns are longer than that for the middle turn, and have goosenecks bent into them for water inlet and outlet. Goosenecks are fitted with quick-connecting type couplings. Copper fins give strength and support to the coil turns and promote heat transfer from the bearing cooling oil to the circulating water. Materials cost about $36.00.

Now, a breakthrough in protection for apparatus operating under humid, contaminated conditions. Tests show that RESISTRAC insulating members *do not track* after hundreds of times the exposure required to fail phenolic (illustrated).

New GLASTIC RESISTRAC*
Fiber Glass Alumina-Polyester

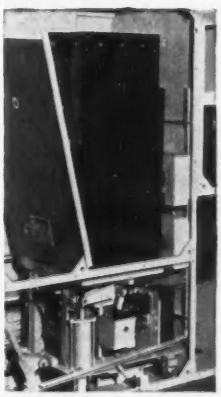
Far greater fault protection—especially in humid, contaminated atmospheres—is available in apparatus insulated with Glastic RESISTRAC.

This new alumina-filled polyester insulation has more than 1500 times the track resistance of phenolic laminates, 30 times the resistance of conventional fiber glass polyesters, as shown in the suggested ASTM dust and fog tracking test.

In addition to outstanding track resistance, RESISTRAC has superior flame retardance, low water absorption, low power factor, and excellent physical properties typical of all glass reinforced polyester materials.

It has received immediate acceptance. RESISTRAC parts—sheet, moldings and structural shapes—are already in use in 5 and 15 KV metal clad switchgear made by three major suppliers.

Discover *all* the advantages of this new advance in insulating materials. Ask your apparatus supplier about RESISTRAC. And write us for complete engineering data.



RESISTRAC is used in *Allis-Chalmers* high voltage switchgear.

See RESISTRAC demonstrated at the Insulation Conference (NC-AEI), Washington, D.C., December 8-10, Booth 53. Compare RESISTRAC's track resistance with other materials, even melamine.

*Trade Mark. Users of Glastic RESISTRAC are licensed for its application as covered in U.S. Patent 2,768,264.

THE GLASTIC® CORPORATION

4315 Glenridge Road • Cleveland 21, Ohio

Electric Heating Reference Sheet

STUART L. FORSYTH, Sales Manager, Electric Heating Dept, Westinghouse Electric Corp, Staunton, Va.

Electric heating is now being used as a primary heating source for homes, schools, churches and commercial buildings. It also provides auxiliary heat for driving off the chill of early fall or late spring, or to heat expanded basements or additional rooms.

Heating comfort exists when the human body's heat-generating process is in balance with its surroundings. As oxidation within the body produces heat at a greater rate than is needed by the body, and as body temperature remains constant at 98.6F, heat must always be thrown off by evaporation, convection and radiation. The fundamental thermodynamic processes can be represented by the equations:

$M = \pm S + E \pm R \pm C$, where
M = metabolism, the heat produced by the body
S = heat storage, the change in intrinsic body heat
E = evaporation heat loss
R = radiation heat lost or gained
C = convection heat lost or gained

The metabolism M is always positive. The storage S may be positive or negative depending upon whether heat is being stored or removed from the body. The evaporation loss, E, is always positive. Both R and C are positive when body surface temperature is above that of the surroundings, and negative when it is below.

Theoretically, it makes little difference whether a wall or ceiling heats the air or heated air heats the wall, ceiling and other surroundings. For comfort, air temperature should be relatively constant between 65 and 85F—usually 72F is considered ideal.

Evaluate Seven Considerations

The electric heating method used in any one case depends on proper evaluation of the following considerations:

1. first cost
2. kilowatt-hour cost
3. maintenance cost
4. reliability
5. flexibility
6. controllability
7. power demand

Central warm air systems use an electric furnace and deliver warm air through ducts to the various rooms. They are relatively high in first cost and kwhr consumption is also relatively high. Their use efficiency is low because the entire capacity is turned on even though heat is needed in only one room. This results in practically no diversity of demand.

Central wet systems employ an electric boiler or hot water heater and use steam or hot water pipes to carry the heat to rooms. These generally have both high original cost and high operating cost. Response to temperature changes is slow and use efficiency is very low.

Off-Peak Systems Have Some Characteristics

Off-peak systems are special applications of a central system, so they have the same inherent characteristics. Heat produced by electricity during off peak periods is stored in water, chemicals or in large masses until needed. First cost is even higher because additional space is required. There is no flexibility, and power demand is high.

With low-cost off peak rates, kwhr cost may be low, but it usually isn't low enough to offset increased fixed charges and maintenance costs. It takes only a few installations to change the off-peak period to maximum peak, because diversity does not exist.

Heat pump systems provide cooling as well as heating. Under certain conditions, the heat pump needs less than half the energy required by resistance-type heaters. When cold weather occurs, however, supplemental heat generally must be provided. When used as a central heating system, the usual characteristics exist and the first cost is usually high. Where cooling is a dominant comfort requirement they offer distinct advantages.

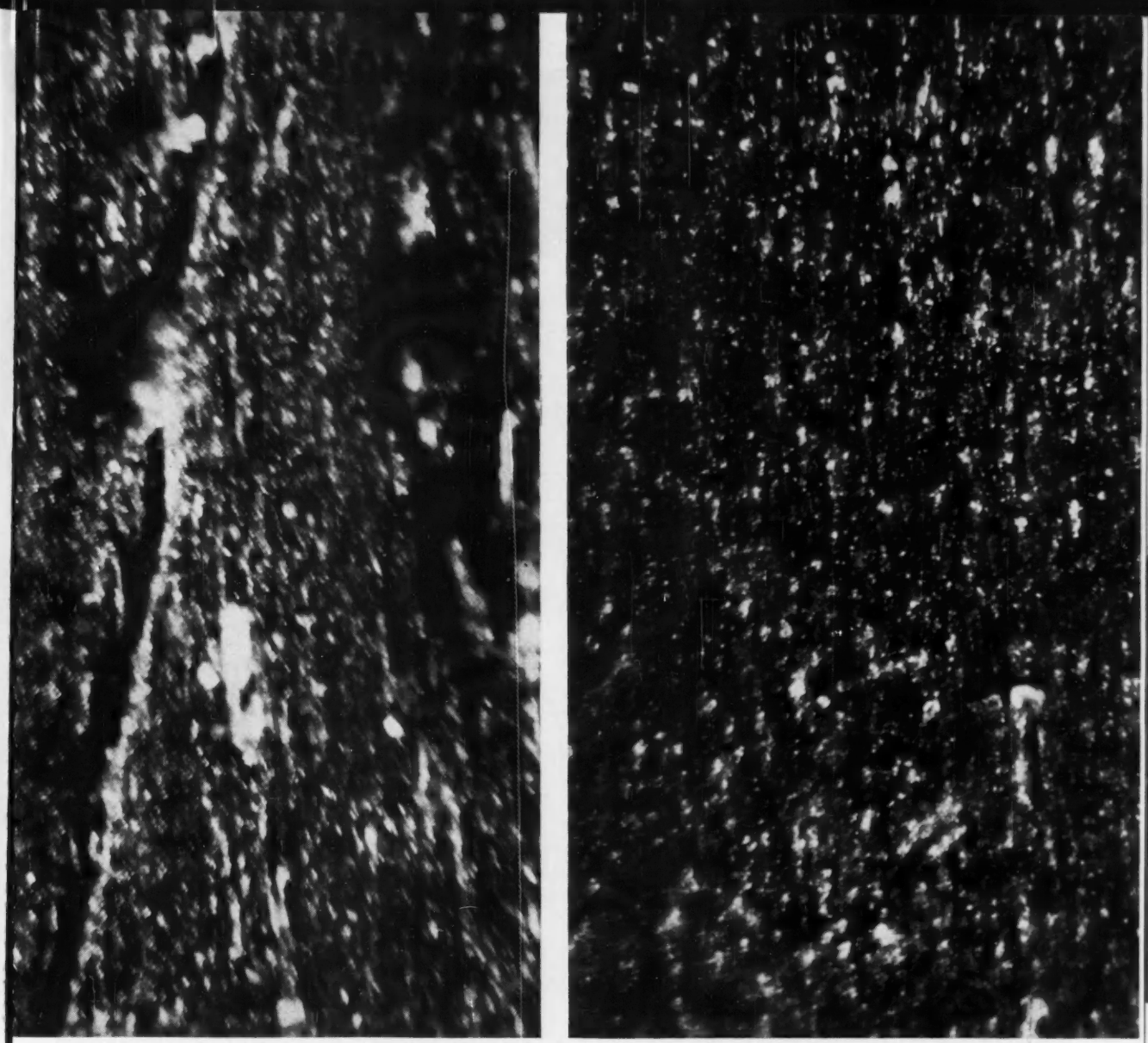
Panel heating systems include all methods which heat the ceiling, floor, wall or other large areas. To the usual high first cost must be added the cost of additional insulation specified by practically all manufacturers. High ceiling temperatures, which cannot be avoided, increases heat lost to the attic. The large heated mass prevents flexible control.

Unit heating systems have found the widest application, because one or more units can supplement other types of heating, or several can produce comfort for an entire building. First cost and operating cost are low. They require little maintenance and have long-established reputations for reliability. A different temperature can be maintained in each room, or one room at a time can be heated. Control is easy, as thermal storage is small and each unit can have a built-in thermostat which responds quickly to small temperature changes.

Individual control is important, because it gives diversity of power demand. Installation is as simple as installing an outlet.

Baseboard units give added advantages of spreading

(*Continued on page* 105)



One of the best tests for comparing high-voltage compound dispersion consists of cutting thin sections from cable insulation—then stretching them and examining them under a microscope. Above, you see magnified sections of ordinary cable insulation (left) and Anaconda Butyl (AB) insulation (right). Note the even grain structure, the better dispersion of the Anaconda Butyl (AB) Cable.

IT TAKES A MICROSCOPE TO TELL THE DIFFERENCE BUT THE DIFFERENCE IS CRUCIAL

Even butyl—the most effective rubber insulating material ever developed for high-voltage cable—requires additives to bring out all its superb insulating properties. These additives are usually in the form of finely divided powders which are extremely difficult to disperse uniformly in the raw butyl.

The microscope helps show you that conventional mixing (upper left micrograph) produces poor uniformity, leaves many additive particles undispersed. Actual service proves these flaws drastically shorten your high-voltage cable life.

That's why Anaconda developed an entirely new mixing process. In fact, built a new plant for just one product—Anaconda Butyl (AB) Cable. The micrograph on the right helps show you one result—uniform, better dispersed insulation. And actual service proves this means long trouble-free cable life.

For real long-range economy, specify Anaconda Butyl (AB) Cable when you buy high-voltage cable. Send for Publication DM 5903: High-Voltage Durasheath* Cable to Anaconda Wire & Cable Co., 25 Broadway, New York 4, N. Y.

*Reg. U.S. Pat. Off. 59259

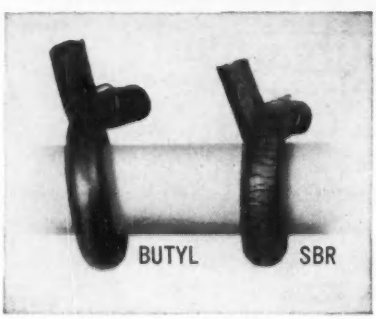
ASK THE MAN FROM

ANACONDA®

ABOUT BUTYL (AB) HIGH-VOLTAGE CABLE

ENJAY BUTYL

FOR RESISTANCE TO SUNLIGHT AND WEATHERING



Butyl's high resistance to ozone is graphically demonstrated when compared with SBR or natural rubber

Enjay Butyl rubber has demonstrated for many years its outstanding ability to resist deterioration caused by sunlight and weathering. This inherent resistance of Butyl to ultra-violet light, ozone, oxidation, moisture and mildew, has made possible many new and colorful products. Butyl has also increased the life of other products such as weatherstrips, protective coating, garden hose, wading pools and many automotive parts.

Butyl *also* offers...outstanding resistance to chemicals, abrasion, tear and flexing . . . superior damping qualities . . . unmatched electrical properties and impermeability to gases and moisture.

For more information call or write the Enjay Company.

ENJAY® BUTYL

EXCITING NEW PRODUCTS THROUGH PETRO-CHEMISTRY

ENJAY COMPANY, INC., *15 West 51st Street, New York 19, N. Y.*

Akron • Boston • Charlotte • Chicago • Detroit • Los Angeles • New Orleans • Tulsa

Electric Heating Reference Sheet (*Continued from page* 102)

the heat out and flexibility in furniture arrangement. The number of heating sections required to provide the correct capacity are easily fitted together to form a continuous unit. A control section with built-in thermostat can be incorporated, or a wall thermostat can be used. No major structural changes are required, and installation in either existing or new construction is as simple as installing an outlet.

Enough heating capacity must be installed regardless of the type of equipment used. Heat lost to the surroundings must be replaced to maintain comfort. The required capacity can be determined from the relationship:

$KW = W \times A \times T_i - T_o$ where
KW = heating capacity needed
W = heat transmission coefficient in w/sq ft/deg F temperature difference
A = area in sq ft of surface through which heat is lost
T_i = inside temperature—usually 70F
T_o = outside design temperature

Heat transmission coefficients (W) can be determined by tests or computed from values of normal conductance of the various components.

Tolerance limits must be considered, as with all calculations. Generally, capacity determinations that are within 10% of each other are considered equal. For any one room, experience has shown that calculations within 500 w are accurate enough. When capacity installed in one room is less than calculated, additional capacity should be used in another room to bring the total to within the design tolerance.

Total Cost Depends on Capacity

The total cost of electric heating depends upon how much capacity is installed, how much it is used and the power rate. Wherever electricity can be purchased for 1.5¢ per kwhr or less, electric heating is competitive with oil at 16¢ per gal. In some cases a higher power rate is competitive with fuels at a lower price. In making a comparison with other heating systems, consideration must be given to all the factors influencing the total cost.

Installation cost of a modern electric heating system is about 60% of a comparable combustion heating system. As the initial cost is less, depreciation charges are reduced. A good electric heating system has no moving parts, so maintenance costs are low.

Operating cost valuations must give full consideration to "use efficiency." A good electric heating system uses all energy available. It supplies comfort where and when it is needed. There is no need to heat the entire house just to get comfort in one to two rooms.

With a central fuel-burning system, combustion losses reduce efficiency. There is also a reduction in efficiency resulting from the inherent characteristics of such systems. No matter how much or how little heat is required, the entire output of the system must be turned on. Often the amount of heat actually used will be only a small fraction of available energy. This is particularly true on mild days.

Consumption Can Be Estimated

Kilowatt-hour consumption can be estimated by careful use of the formula:

$$KWH = \frac{KW \times DD}{TD} \times C$$

KWH = estimated annual kwhr for heating
KW = calculated heating capacity required for design conditions
TD = temperature difference for design conditions
DD = annual degree days
C = correction factor — theoretically should be 24, but because of many variables it is usually less. Generally, the value decreases as the number of thermostats used to control a given electric heating capacity increases. NEMA recommends a value of 18.5 as conservative. A value of 12 has been found practical for applications of equipment which put heat directly into the room.

Actual kwhr consumption will vary because of variations in the following:

1. Weather conditions
2. Type of construction and amount of insulation used
3. Type of heating equipment used
4. Living habits of the occupants such as:
   a. the number of people and their ages
   b. the temperature maintained
   c. how often the heat is turned down or off
   d. how often the doors and windows are opened

Load characteristics of electric heating are influenced by many factors. The type of heating equipment installed and the living habits of the users have the greatest effect. Weather conditions, construction details, amount of insulation and other variables are also important. Experience has shown that the distribution system required to serve an isolated house is usually about 60% of the total connected load. This is particularly true if electric heating equipment consists of individual units, each with a built-in thermostat, and the distribution system is of the current-protected banked-secondary type.

A further favorable factor is that maximum electric heating demands occur during lowest ambient temperatures. Hence a distribution system can often handle winter peak demands that are two or three times the summer peaks. In most cases electric heating greatly increases annual kwhr usage for the residential customer without creating demands that are worse than those created by ranges, water heaters and dryers.

Procurement & Products

NEW ORDERS ▶ **New orders of machinery are being deferred** as a result of the steel strike. Makers of all types of machinery, ranging from engines and turbines to office machinery, are now forecasting a considerably lower volume of new business in the fourth quarter of this year and the first quarter of next than they forecast in July 1959. These are some of findings of the quarterly McGraw-Hill Machinery New Orders Forecast.

But it is stressed that these are deferals—not lost business. By the third quarter of next year, the engine and turbine manufacturers expect new orders to be running 25% higher than during the third quarter of this year.

BREAKER PRICES ▶ **Federal Pacific reduces list prices** 2½ to 27% on large oil circuit breakers. Reasons for the reductions, according to Frank Roby, executive vice president, are: new manufacturing economies, industry adoption of ASA standards which have resulted in lower bushing prices; and more realistic basing of price differentials between ratings in relation to actual production costs. Breakers included in the price cuts range from 14.4 kv, 100 Mva through 230 kv, 20,000 Mva.

COPPER ▶ **Copper prices jump to an average of 35.225¢ per lb** delivered as Kennecott discontinued its 30¢ prices and no sales were reported at 31½¢. But merchant and exchange prices eased mainly with the rumors that strikes might end soon, reported Engineering and Mining Journals weekly markets newsletter.

ALUMINUM ▶ **Aluminum production is cut back** after reaching toward a record high in October. Some aluminum producers are reported operating on extremely narrow profit margins, and a rise in labor costs would very probably force adjustments upward in prices.

FUEL ▶ **Montana Power Co has leased extensive coal deposits** in eastern Montana from Northern Pacific Railway to provide fuel for a new steam-electric generating plant. In all, the land involved covers some 4,600 acres. The property has produced some 44 million tons of fuel over the past 30 years.

EQUIPMENT ▶ **Tacoma Public Utility Board will exclude foreign manufacturers** from bidding on generators, transformers, switchgear, and other heavy equipment for its Mayfield Dam powerhouse. Decision to limit bidding to U. S. and Canadian firms was reached on the basis that only such firms could provide adequate repair facilities, said Chairman Harry Berry.

News of Manufacturers ..... page 108
New Equipment ..... page 110
Readers Service ..... page 114

Our business is to help you distribute the wealth!

Generating facilities are simply capital investment until the wealth they create in the form of power, is distributed to customers. Your big job is to keep pace with community growth by extending and enlarging your lines quickly as needs arise. With population continually increasing . . . with more and more new homes being built . . . with national average family income rising; and with manufacturing and industrial plants continuing to look to suburban areas for plant sites, you're going to have expansion problems for many years to come.

VICTOR CAN SIMPLIFY YOUR JOB

By choosing your distribution requirements from VICTOR, you automatically save time and money. You eliminate a lot of paper work and uncertainty. By choosing VICTOR, you are *sure* you're getting insulators and hardware that have been thoroughly tested and proven before they go on your lines.

FOR THE LONG HAUL

VICTOR No. 245 R
(EEI-NEMA 56-3)
TRANSMISSION PINTYPE

After several decades of service on lines all over the country VICTOR's High Voltage Pintype Insulators have proven themselves ideal for lines up to 66KV. They're easy to install, inexpensive, and have an amazing ability to perform under the most adverse conditions of service. Specifications on Page 23, VICTOR Catalog No. 56.

FOR SHORT HAULS AT LOWER VOLTAGE

VICTOR No. 6R
(EEI-NEMA 55-4)
LOW VOLTAGE PINTYPE

No VICTOR insulator for *any* service is made with greater care than these low and medium voltage pintypes. The same careful manufacturing, quality control and testing procedures are used as in the manufacture of VICTOR insulators designed for EHV. There's no better distribution pintype made—at any price. Every one is a premium-grade unit. Listed on Pages 15 and 16, VICTOR Catalog No. 56.

FOR DEAD-ENDING OR TURNING A CORNER

VICTOR No. 804
(EEI-NEMA 52-1)
6" SUSPENSION INSULATOR

Under this type of service the VICTOR 6" Suspension (No. 804) is ideal. Withstanding better than 10,000 lbs. of pull, it has a margin of safety that overcomes hazards of ice and wind loading. On pages 27 and 28 of our Catalog 56, VICTOR Suspensions are shown together with specifications.

GUY STRAINS AND SPOOLS

VICTOR No. 2012
(EEI-NEMA 53-2)
SPOOL INSULATOR

VICTOR No. 506
(EEI-NEMA 54-3)
GUY STRAIN INSULATOR

These insulators are made of the same Purified Porcelain as every other VICTOR insulator. They are just as carefully manufactured and inspected as the highest voltage insulator we make. VICTOR guy strains and spools have a smoothness of glazed grooves that is unsurpassed. And their mechanical and electrical values far exceed those established by EEI-NEMA. Listed on pages 19 and 21 of VICTOR's Catalog 56.

DISTRIBUTION HARDWARE

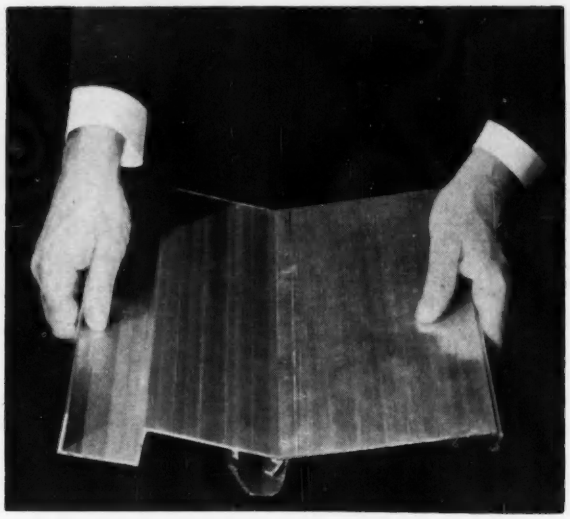
VICTOR No. 2050
DISTRIBUTION CLAMP

VICTOR carries a full line of distribution and transmission hardware manufactured in malleable iron, forged steel and aluminum and cast aluminum. See our Catalog 56, pages 43 to 57.

For specialized information concerning VICTOR Distribution Insulators and Hardware, write I-T-E Circuit Breaker Company, Victor Insulators Division, Victor, New York.

I-T-E CIRCUIT BREAKER COMPANY

VICTOR INSULATORS DIVISION



A-C Markets All-Aluminum Switchgear Housing

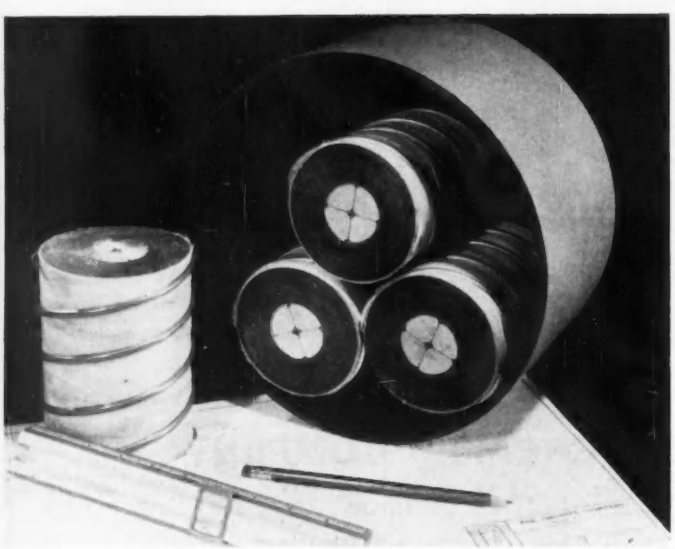
An all-aluminum enclosure for outdoor switchgear housings, developed jointly by Allis-Chalmers Mfg Co and Reynolds Metals Co, is being marketed by A-C. Aluma-Clad is available in all sizes and voltage classes for either the 5 or 15-kv A-C metal-clad switchgear. Advantages in erection, inspection, and maintenance are claimed for the extruded panel design (see section of panel, above rt).

The aluminum panel extrusions snap together to form walls, floor and roof so that joints between are weather-tight. Major panel sections are fastened by aluminum alloy bolts with closed cell gasketing between adjacent panel sections.

Removable floor panel extrusions permit access to the area beneath the switchgear housing and the interlocking sections can be removed one at a time for inspection purposes. The 75-in. service aisle provides an enclosed area with a smooth surface on which to roll high-voltage breakers for inspection.

Two extrusions to the running foot with dual interlocking edges contribute to floor loading strength as well as to wall rigidity. Concrete pier foundations, rather than an entire slab to support the base, are adequate because of the greater rigidity of the extruded structure of the housing, says A-C.

Directed air flow within the housing keeps internal heat at a minimum. Heat from external radiation is negligible due to the high degree of reflectivity of the ribbed surfaces.



Okonite Ships 345-kv Cable

The Okonite Co has delivered the first 345-kv cable for the extra-high-voltage cable field testing program which will be conducted in Cornell University's new cable research facility. A committee of Associated Edison Illuminating Companies and Edison Electric Institute representatives is coordinating the tests with the university's electrical engineering staff.

Various designs of 345-kv cable will be supplied by Anaconda Wire & Cable, General Cable Corp, and Phelps Dodge Copper, and will be submitted to a long series of tests under simulated service conditions for about three years.

The Okonite cable, for a high-pressure, pipe-type system, is a 2-million cir mil segmented sector type with 500-Mva capability. About 1,500 ft of cable was shipped on three reels. Okonite carried on a four-year development program to design the cable.

(*More Procurement & Products, p* 110)

NEW THUMB OPERATED CRIMPER

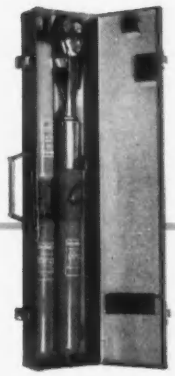
LEAVES ONE HAND FREE to handle conductor!

The new Chance CO_2 Compression Tool is operated with one hand, leaving the other hand free to position conductor and sleeve. Its replaceable CO_2 cylinder provides the power. With no more exertion than a press of the thumb, your lineman can crimp aluminum connectors and line taps.

The tool is simple to use, mistake-proof. A safety key locks the trigger. When ready to crimp the connector, pull the key, place the head of the tool over the sleeve, align it with the crimp marks, and squeeze the trigger. The tool will make a correct crimp, automatically, every time.

Made of heat-treated steel and aluminum, this light, well-balanced crimping tool handles any service connector or tap that uses ½", ⅜", or C dies. All three sizes fit this one tool. The dies are easy to attach, and automatically seat themselves.

The tool can perform 50 to 70 operations before the CO_2 is exhausted. Empty cylinders can be replaced in seconds. They may be refilled at local CO_2 dealers, fire extinguisher services, or your own refill station. The tool needs only simple maintenance. Light oiling will keep it in tip-top shape.



So, make it easy for your linemen to make connections correctly . . . get the new Chance Compression Crimping Tool for service connections. We've given it Catalog Number CA-800. It, and two extra CO_2 cylinders, come packaged in a sturdy metal box. Ask your Chance Sales Representative for the whole story, or write us.

CT59-27

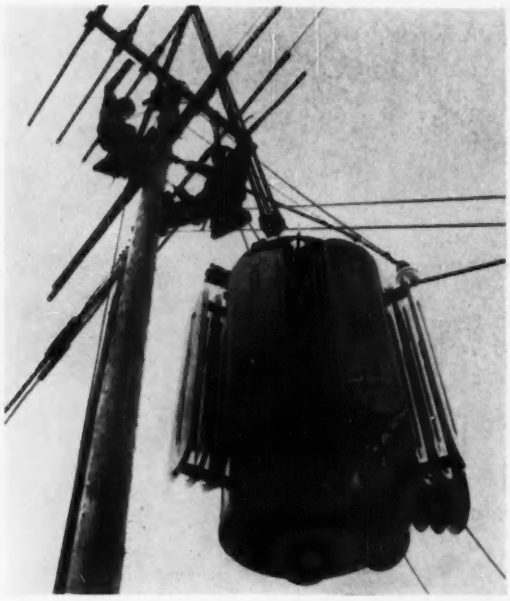
A. B. CHANCE COMPANY

GENERAL OFFICES: CENTRALIA, MO.

A. B. CHANCE CO. OF CANADA, LTD., TORONTO

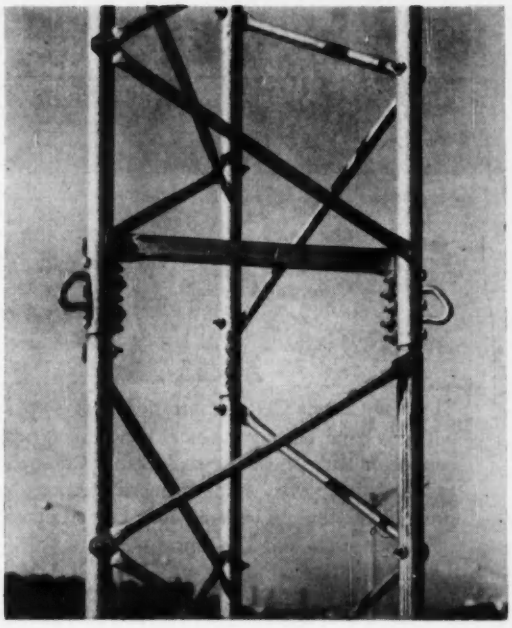
ABC INDUSTRIES

(For further information refer to Readers Service on page 114)



Distribution Transformers . . .

. . . in a new line through 500 kva are now available. The single-phase 333 and 500 kva, and the 3-phase 225, 300 and 500 kva replace present station-type construction through 15 kv. The lightweight units eliminate various tank accessories formerly standard on station-type units. The large distribution line is intended to fill the need for transformers that step down to utilization voltages such as 240/480 v.
General Electric Co, Schenectady 5, N. Y.



Communications Towers . . .

. . . of tubular alloy steel provide structures from 10 to 500 ft in height. Towers are of three-sided sectional design. Sections are 10 or 20 ft long, in four weights. The heaviest towers can be raised to 500 ft with 30 lb per sq ft windloading, or up to 360 ft with 40 lb per sq ft windloading. Guys are specified for towers more than 100 ft high in the heaviest models, and for lesser heights in lighter models.
Communications and Industrial Electronics Div, Motorola, Inc, 4501 W Augusta Blvd, Chicago 51, Ill.

Earth Borer . . .

. . . has power-leveling mechanism. The device, which makes positioning fast and easy in all directions, is optional equipment on Models HDA and HDAMS earth borers. It is designed for positioning at any angle up to 90 deg. It also permits fast maneuvering of the machine both fore and aft and left to right. Vertical drilling is possible regardless of truck position.
Highway Trailer Co, Edgerton, Wis.

(*More New Equipment on page* 112)

why choose **THIS**

when you can have **THIS?**

* **PRESSURE-RELIEF CAP CUTOUT** photographed in action discharging the cap, fuse link button head, and ionized gases upward into the primary.

* **HUBBARD EHD FAULTMASTER CUTOUT** with exclusive Single-Vent Small-Bore action discharging all gases down and away in a single confined cone.

** Both photographs are open shutter exposures, taken of cutouts tested on a 15 kv circuit with 8000 amperes available.*

Manufactured in Canada by
N. Slater Co., Hamilton, Ontario

BETTER PRODUCTS *through Creative Engineering*

HUBBARD

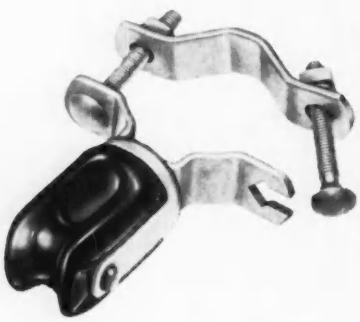
AND COMPANY · 200 SOUTH MICHIGAN AVENUE · CHICAGO 4, ILLINOIS

Anchors . . .

. . . **in two new lines** are now available. The EEA Expanding Earth Anchor (top) features 4 extra-long

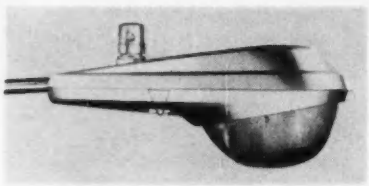
V-Way blades that are heavily flanged for high rigidity and penetration. Type EEA anchors are available in eight different square-inch sizes and in 8 and 10-in. base sizes. The CEA Type Cone Anchor Line (bottom) is cast from gray iron

and has rippled horizontal ribs cast in the cone surface to increase holding strength. It is available in 8, 10, 12, 16, 19 and 26-in. diameters.
Penn-Union Electric Corp, Erie, Pa.



Wireholder . . .

. . . **is suitable for 1¼ to 3-in. pipe.** The JO588 Service Mast Wire Holder has a slot in the end of one of the clamping straps which just clears the unthreaded portion of the carriage bolt, permitting the device to be installed without removing the bolts. Square holes lock the carriage bolt heads to prevent turning. All metal parts are hot dip galvanized.
Joslyn Mfg and Supply Co, 155 N Wacker Drive, Chicago, Ill.



Mercury Luminaires . . .

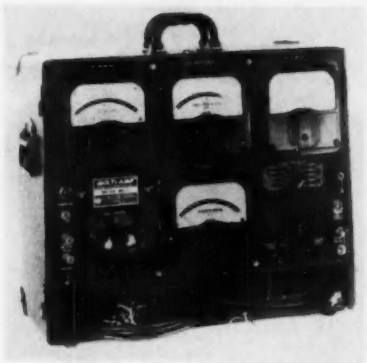
. . . **are designed for high level lighting** of streets, highways and parking areas. Known as Line 2A2, the integrally-ballasted luminaires are equipped with an adjustable mogul socket, a one-piece heat-resistant glass refractor, and a 120/240, 277 or 240/480-v constant wattage or reactor ballast. A series ballast is also available. They are furnished for use with or without a photoelectric control and accommodate clear or color-improved mercury lamps rated through 400 w.
Line Material Industries, McGraw-Edison Co, Milwaukee 1, Wis.

Cover Finish . . .

. . . **for voltage regulators** is designed to prevent animal-caused outages. Melalast is a modified epoxy resin which insulates squirrels and birds from line-to-ground short circuits, yet permits a slight shock to send them on their way.
General Electric Co, Schenectady 5, N. Y.

Test Unit . . .

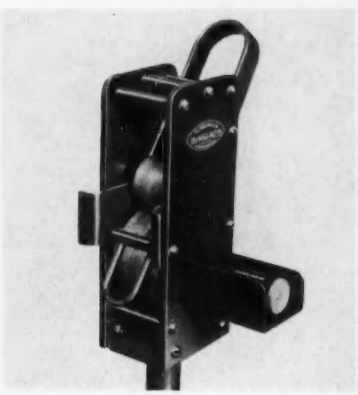
. . . **for calibrating ammeters,** voltmeters and other indicating instruments is designed for service in the field and in the laboratory. Designated Model MC3, the unit consists of four output circuits to



provide the currents and voltage for calibration. An accuracy of ± 0.75% full scale is provided in the standard unit. Instruments of lesser accuracy and more rugged construction are available for field service.
Multi-Amp Electronic Corp, Box 217, Union, N. J.

Cable Meter . . .

. . . **permits quick measurements** of wire and cable up to 2-in. diameter. The Model HCM Hykon Cable Meter measures up to 1,000 ft and



has an instant zero-reset. A swivel wire guide adapter is built in for measuring small wire sizes, and a floor-type meter stand is adjustable from 30 to 48 in. in height.
Hykon Mfg Co, 135 E State St, Alliance, Ohio.

Terminal Adapters . . .

. . . **for distribution transformers** allow the use of two or more cable taps from each secondary terminal,
(*Continued on page* 114)

"The right technique *plus* the right tools are what it takes to get the most out of any investment in wood," says a good hobbyist friend of ours.

Many industrial wood users share this viewpoint. It's one of the major reasons they give for consistently specifying AMCRECO pressure-treated products.

Take the preservation method. Service records – some going back over 50 years – show that AMCRECO pressure treatment provides the longest, most dependable wood protection. Added to this is a big plant modernization and expansion program which totals nearly one million dollars... new, improved facilities that help insure fast service to all AMCRECO customers.

Why not consider this unusual combination of experience and equipment before you place that next order?

AMERICAN CREOSOTING CORPORATION

AMCRECO PRESSURE TREATED WOOD PRODUCTS

Louisville 2, Kentucky

Subsidiary of Union Bag-Camp Paper Corporation

Readers Service

For additional information on new products, supplies, and services in this issue, the Manufacturers Editor of Electrical World offers his facilities. Check items in which you are interested in list below:

NEW EQUIPMENT

GE ..... Transformers ☐
Motorola ..... Towers ☐
Highway Trailer ..... Earth Borer ☐
Penn-Union ..... Anchors ☐
Joslyn ..... Wireholder ☐
Line Material ..... Luminaires ☐
GE ..... Cover Finish ☐
Multi-Amp ..... Test Unit ☐
Hykon ..... Cable Meter ☐
Anderson ..... Adapters ☐
Aro Equipment ..... Lubricator ☐

OTHER

Manufacturers Editor
Electrical World
330 W. 42nd St.
New York 36, N.Y.

* Note: Requests must be received within four weeks of publication date, accompanied by complete information specified. This service cannot be offered to readers in foreign countries or to competitive manufacturers.

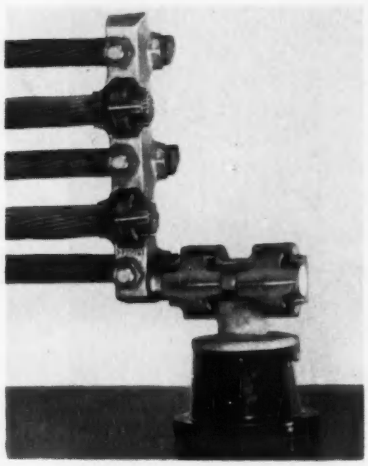
NAME_____
TITLE_____
DEPT._____
COMPANY_____
ADDRESS_____

FOR:
Reference ..... ☐
Specs ..... ☐
Trial ..... ☐
Purchase ..... ☐

NOVEMBER 30, 1959

Terminal Adapters . . .

(*Continued from page* 112)



eliminating excessive connections and taping. The V&H Series adapters will accommodate up to six cables and cover a copper conductor range of from No. 8 solid to 1,000 MCM.
Anderson Electric Corp, Birmingham Ala.

Portable Lubricator . . .

. . . holds 5 lb of grease and provides one-hand operation for servicing any machines equipped with hydraulic grease fittings. Called the Aro-Pak, the air-primed device may be loaded by a lube pump or through use of a filler. The control handle is a pressure-boosting type, developing pressure to 7,500 psi.
Aro Equipment Corp, Bryan, Ohio.

More New Products

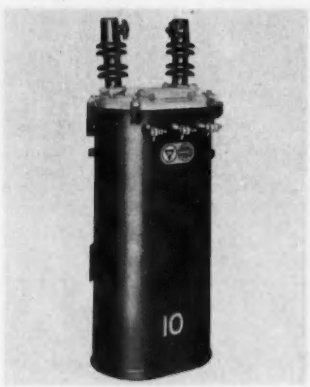
Penetrating **rust solvent** has exceptional wetting power. Known as KPO No. 1, the solvent also has the necessary film body to lubricate parts being disengaged.—Keystone Lubricating Co, 3100 N 21st St, Philadelphia 32, Pa.

Three-phase **pullout switch** is available in both 30 and 60 amp. The fused switch is designed to control motors, air conditioners, heat pumps, and other equipment.—General Switch Co, 45 Roebling St, Brooklyn 11, N. Y.

THW **building wire** has rating of 75 C and can be used for both wet and dry locations. It is low cost, light weight, and has excellent color definition.—Ettco Wire & Cable Corp, 46-50 Metropolitan Ave, Brooklyn, N. Y.

High-visibility **flagman's vest** is made of fluorescent vinyl-bonded-to-nylon fabric. Coated and polished on both sides, the vest is completely reversible.—Industrial Products Co, 2808 N Fourth St, Philadelphia 33, Pa.

Correction



Transformers . . .

. . . have plastic-coated covers to eliminate outages caused by wildlife contacting terminals. They were erroneously described in the November 9, 1959, issue as having the coating over the entire transformer.
Line Material Industries, McGraw-Edison Co, Milwaukee 1, Wis.

Busy making plans for the coming year?

LOOKING FOR WAYS TO:

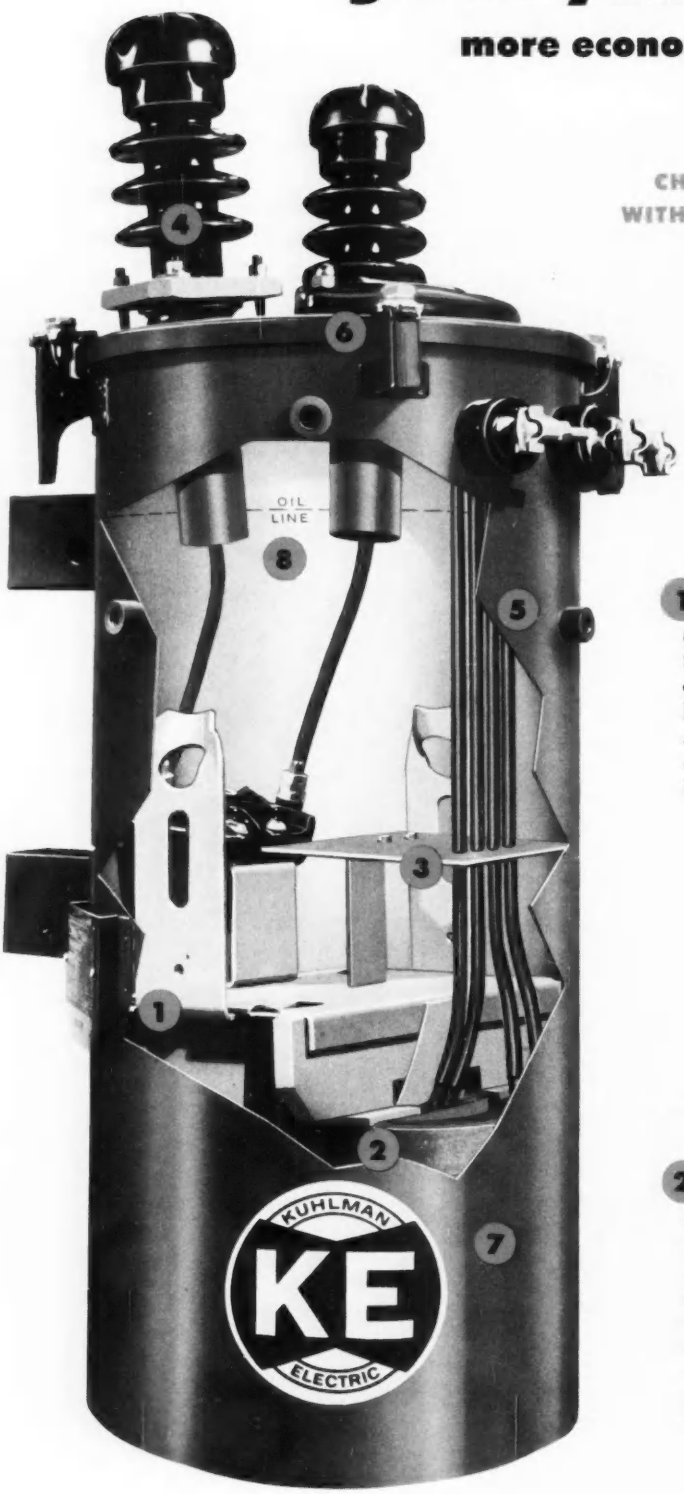
CUT COSTS... MEET GROWING LOADS...

PEP-UP YOUR DISTRIBUTION SYSTEM?

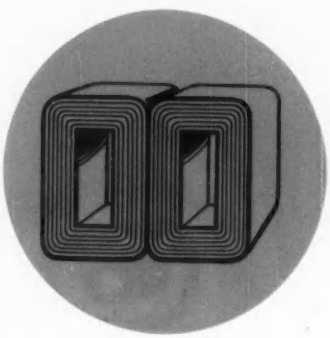
HERE'S IMPORTANT NEWS FOR YOU

The Kuhlman '60

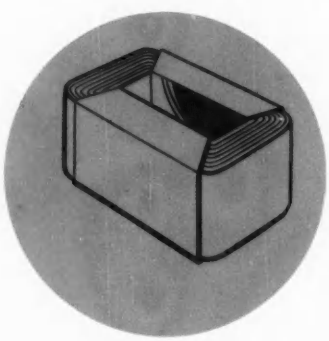
gives you... more dollar value... more economy... better performance and greater reliability.



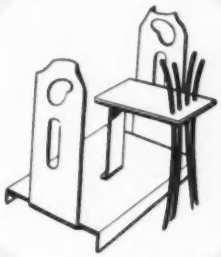
CHECK YOUR SPECIFICATION STANDARDS WITH THESE 8 MAJOR KUHLMAN FEATURES:



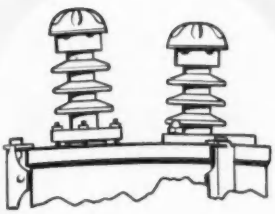
1 **"Low-Loss" BENT IRON Core** . . . for more than a quarter of a century, the key to modern transformer design. Now, improved to give lower exciting current—lower impedance—better regulation—new operating economy. Controlled-atmosphere annealing, coated laminations, firm, compact construction assure full utilization of the best inherent qualities of grain-oriented steel.



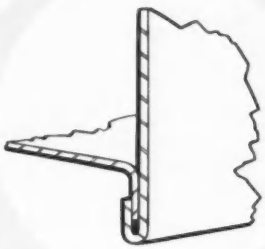
2 **"Long Life" Coil** . . . electrically and mechanically stronger. Special coated insulation bonds windings and insulation into a tight, compact unit. Generous oil ducts provide cooler operation, longer life, higher short-time overload capacity. Production-Line Impulse Testing assures insulation will withstand severe lightning and line surge conditions. Individual winding layers are braced to prevent shifting. Entire coil is rigidly supported to withstand short-circuit stresses.



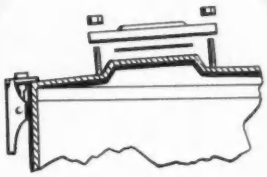
3 **"Shake-Proof" Leads** . . . insulated and firmly held in lead guides. Lead size, connector and crimping are coordinated to insure snug fit, corrosion-free connections. Connectors—designed and micro-checked for minimum 85% pull-out strength and greater than 100% relative conductivity—won't work loose . . . Operate cooler than the conductor, itself.



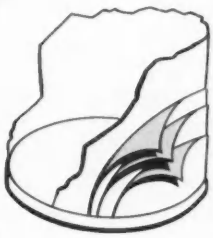
4 **Original "Quick-Grip" HV Connector** . . . cover or sidewall mounted. The big hand-grip insulating connector permits fast, simple line connections. Also, prevents outages caused by birds and animals coming in contact with energized parts or short-circuiting across high voltage terminals. Both sidewall and cover mounted designs accommodate either copper or aluminum conductors and minimize cold flow of aluminum.



5 **"Space-Saving" Tank** . . . slimmer and trimmer. New designs save space on the pole or in storage. All tanks are seam welded and pressure tested for leaks. Rolled-under base provides added strength, moisture drainage, and easier handling. Brackets are projection welded in a continuous weld to eliminate crevices and moisture traps. Cover fits tightly to seal out moisture.



6 **"Air-Tight, Oil-Tight" Seal** . . . moisture can't get in—oil can't get out. Pressure-sealed, moisture-proof gaskets that combine long life with mechanical strength and resiliency fully protect insulation and oil. At no point is there metal-to-metal or porcelain-to-metal contact except to limit gasket expansion. Sizes and gasket composition tailored to the application assure an air-tight, leak-free seal.



7 **"Hot Spray" Finish** . . . NEMA grey outside, gleaming white inside. Both finishes provide maximum all-season protection. Hot Spray puts less solvent, more weather-resistant paint solids on the tank surface. Result: thorough, even coverage with a heavier-filmed, longer lasting, denser finish.

8 **"Perma-Kuhl" Cooling** . . . protects and adds years to service life. Perma-Kuhl is a special, inhibited, highly refined mineral oil that stays fresh and in perfect operating condition long after the reclaiming point of ordinary oils. The inhibitor increases maintenance-free life by retarding oxidation and oil sludging which tend to weaken insulation and impede oil circulation.

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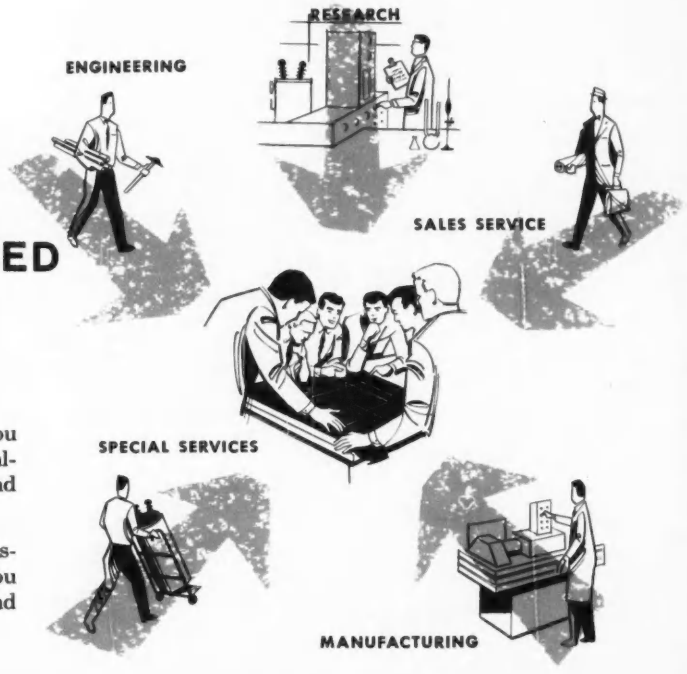

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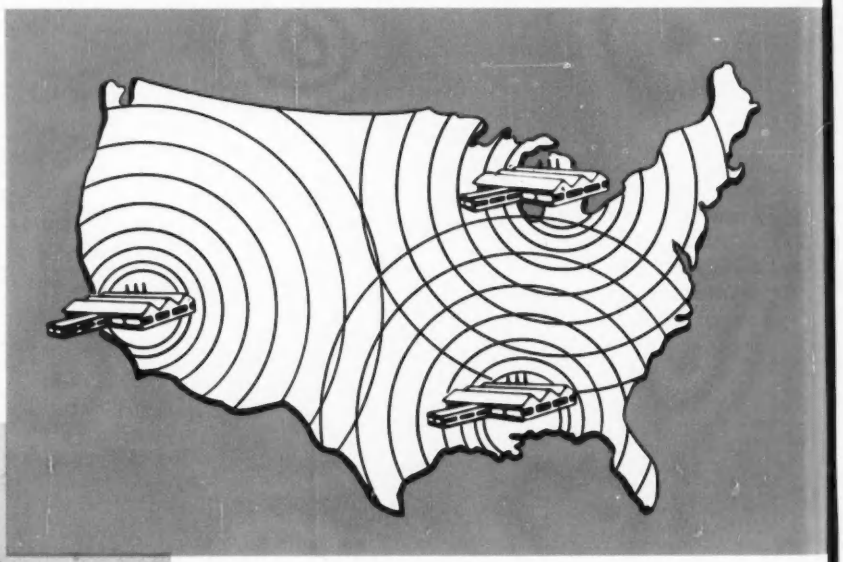

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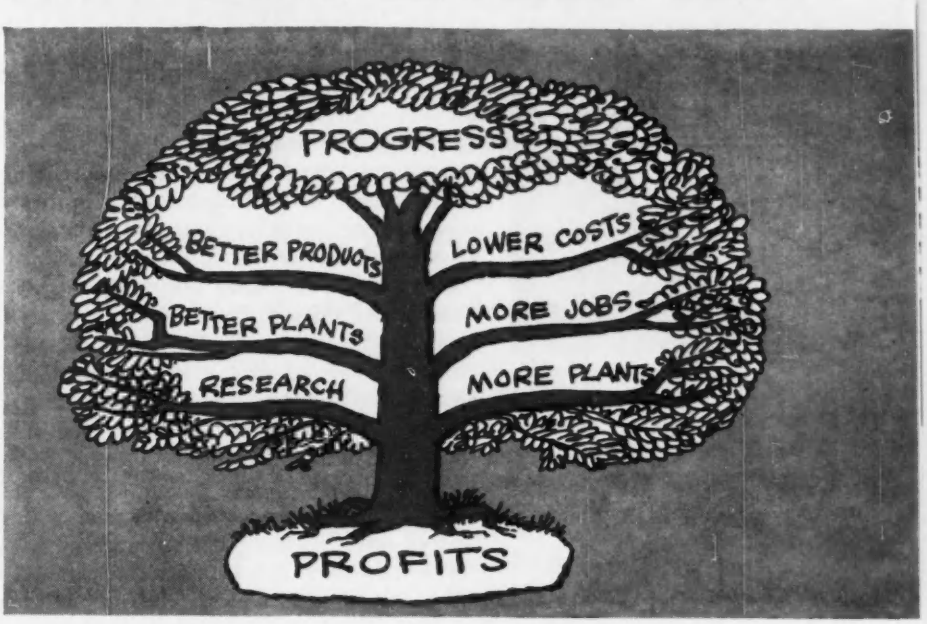


Report on
Profits and Progress I

The Value of Profits

A plain-spoken defense of profits and their role in the U. S. economy has been needed for a long time. Although America was discovered for profit, explored and settled largely for profit, and although the U. S. has reached its present pinnacle of industrial power and comfortable living under an economic system that is driven by its citizens' vigorous pursuit of profit, the fact remains that, to many educated Americans, "profit" is a dirty word.

A remarkable study by the American Telephone & Telegraph Co has made an important contribution to this long-needed defense. The study was conducted by a committee composed of some 50 executives from member companies of the Bell System. It took almost a year to complete. Its result is a long, detailed, and well-documented report showing evidence that the regulated industries need higher profits than they are now allowed if they are to contribute their full share to the U. S. economy.

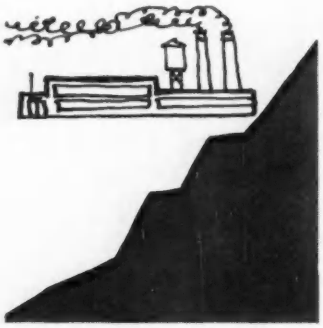
The AT&T report challenges a common regulatory attitude that allowing a utility to make only marginal earnings is the best way to ensure good service at a low price. The facts brought out in the study point to the opposite conclusion—showing that good profits are as much a spur to good service in a regulated industry as in a freely competitive one; and that the customer, the employee, and the community benefit most from a company whose earnings are good.

The report attempts to prove three basic propositions:

- **Profit is the key to progress in the U. S. economy,** in regulated industry as well as non-regulated.
- **Regulated industry should earn profits comparable with non-regulated industry,** and not just enough to cover the "bare bones" cost of capital.
- **"Fair value" provides the best route to adequate earnings for the utilities.**

Three Management Newsletters will be devoted to the AT&T study. Next week's newsletter will cover AT&T's findings in support of the comparable earnings

standard. The following week, the subject will be the case for "fair value." This article discusses AT&T's findings concerning the role of profit in the U. S. economy—regulated and non-regulated.



An Economic Law: Profits Build Progress

In competitive industry, profit and progress are inseparable. That conclusion stands out from AT&T's study. Evidence from the steel, office equipment, retailing, and electrical equipment industries shows that good performance has come from companies with good profits. One prime example is International Business Machines Corp, which has earned about 11% on capital since the end of the war. About two-thirds of this has been ploughed back into the business to finance growth and research. This policy has paid off for IBM and for the country. Today IBM's sales are more than eight times what they were in 1946. Capital is nearly nine times as high. The company provides four times as many jobs. It has made a great contribution to the national defense. It is still making money and still racing ahead with research into more and better products for the future.

Poor profits are associated with poor performance. The textile industry is a sad example. Textile profits were recently reported by *Harvard Business Review* as next-to-lowest in a list of 33 industries. Over the long run, the industry has earned about 6% on capital—about half as much as all manufacturing—and in the last seven years its profits have slipped even lower.

Competition between textile companies is mainly price competition. Prices are often cut to the loss level to keep a mill running. The result is frequent bankruptcies. When a mill fails, another manufacturer may buy it at a fraction of its cost—lowering his overhead so that he can reopen the mill, produce textiles at still lower cost, and cut prices further. There is not enough money coming into the industry to permit development of new products and processes, so competition continues to be confined to price cutting.

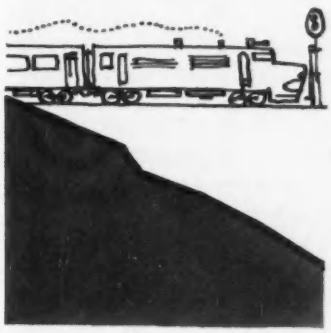
In the last ten years, New England has lost more than half its textile jobs—160,000 in all. This has been a disaster for many New England towns which depended on the textile mills for jobs and taxes. Now the South, to which many of the New England mills moved, is in its turn beginning to suffer bankruptcies and closings. Price competition continues. Profits have not improved. Over the long pull there seem to have been few gains for anyone—customer, company, or community—in the low profits earned by the textile companies.

There can be sharp difference in profit within an industry, of course. Consider the cases of two meat-packing firms. As with textiles, meat packing shows poor profits. The industry ran dead last in *Harvard Business Review's* 33-industry list. But Company A has earned an average of 10.7% on capital since the war, while Company B has earned only 2.5%. The end of wartime meat rationing brought six years of growth to the packers. In these years Company A's assets grew by 135%, half in inventories and half in plant. Three-fourths of the money for this came from retained earnings and depreciation, while investors cheerfully furnished the rest. Meantime Company B, with poor profits, had to borrow to finance expansion. Its assets grew by only 38% in the post-war years, and most of that growth was inventories. By 1951 nearly half of its capital was debt.

There followed another six years when the selling was harder. With good profits, however, Company A was strong enough to risk and innovate. So it went on growing. Its assets went up by a third. The market price of its common stock climbed. Consumers got more products. More jobs were provided. For Company B, however, these were painful years. Profits were low. It cut its modernization expense. It could not replace obsolete plants. Assets went down by a third,

and stock dropped to the 1945 price level. Jobs were cut in half. Plants were closed. Buildings and equipment became an economic waste.

Today Company A employs 80% more workers than in 1945. Turnover is low. The company is still prospering, spends three times as much as Company B for advertising, and has established its brand names with the consumer. While Company B suffers from exaggerated price competition like that in the textile industry, Company A, with better profit, has been able to win customers by competing on quality and product as well as on price.



Regulated Industry Is Not Exempt from Economics

Nor is the need for profit limited to "competitive" industry. The railroads are an outstanding example of the damage that can be caused by low profits in a regulated enterprise. The railroads are the backbone of the U. S. transportation system. The great bulk of our industrial product travels by rail on its way to the consumer. In time of war, railroad operation is vital to the national security. Yet today the railroads are in such distress that many of them have been reduced to begging aid from the federal and state governments.

The decline of the railroads is a story of restrictive regulation. For decades they have had little freedom of action. Because of its fear of the extensive early power of the railroads, the government has hobbled them by means of tight rate regulation, subsidies for competitors, discriminatory taxes, wasteful labor laws, outdated safety codes, and a steady erosion of the freedom of railroad managements to manage. "Changes in operation which would be a matter of course for non-regulated business are held up for months if not years," says an officer of one railroad. And another remarks that "As a practical matter, there are no standards of regulation other than those set by political expediency."

Profits under regulation have never been good, and today are drastically low. In regulating rates, the government has cut them to the bone—and often deeper. Fifty years ago the railroads earned an average of a little more than 5% on capital. In the last ten years the average has been below 4%.

These profits are so poor that the market for equity capital has dried up. None has been raised for nearly 30 years. Even debt money is hard to raise, for earnings have been scarcely higher than the interest rate on the remaining "Aaa" railroad bonds. Depreciation is not much help, since depreciation reserves are too small and charges too low. With present profit levels, it is idle to talk about modernizing rail plant. What money there is goes for more urgent needs.

For the railroads, the end result of poor profits is seen in poor service. With no money for modernization, research, or innovation, they still center their competition on price rather than service—yet most of their business is lost to motor carriers, whose rates are higher than rail rates. Prospects for improvement are bleak. Passenger service is failing fast. Freight service is seriously degraded. Perhaps worst of all, the railroad industry has now been poor for so long that people think the situation is normal.

The airlines, too, face a difficult situation caused by low profits. Unlike the railroads, this is a young, vigorous industry, growing to meet high public demand. As it has grown, service has improved also. New and better planes have been added. Courtesy standards are high. But, like the railroads, the airlines live in a tangle of competition and regulation restricting their operation; and, like the railroads, their profits have not kept up with their growth.

Airline profits have been slipping rapidly for the past three years. Following a slow start after World War II, profits rose to an average of about 11% on capital

during the period 1950 to 1956. In 1957 they dropped to about 5%. While revenues have doubled since 1952, profits have been cut in half. And the profit from actual air service is even lower, since part of the airlines' past profit has come from the sale of used planes—a source that is fast drying up.

Meanwhile, the jet age has arrived. Jet airliners fly twice as fast as piston-driven planes and carry half again as many passengers. They also cost three times as much, and they must be ordered years before delivery. It will cost the industry about $4 billion to convert to jets. It is hard to see where all this money will come from. A continuation of low profit levels will prevent the airlines from doing any equity financing. One financial analyst says: "The airlines are no place for the investor. Every time a company gets a profitable route, the Civil Aeronautics Board opens it up to competing carriers and slices profits to bare bones. No one can make any money under these circumstances."

The airlines are already deep in debt. At the end of the war, the industry's debt ratio was 14%. Today it is over 40%. How much farther the airlines can go is a serious question, but even if the whole industry borrows up to 75% of its capital, it will not have enough money to convert to jets. Depreciation is vital to airline financing, but now the CAB is pushing the lines to lower their depreciation rates by assuming a higher salvage value of the planes. At the same time, conversion to jets is making the old piston-driven planes a drug on the market with less salvage value than ever. The airlines point out that they should set aside ample depreciation funds so that they can buy new planes and give better service. A company is slow to replace planes until they are fully depreciated, since this pushes profits even lower. Thus slower depreciation means slower progress in the airline industry.

It's clear that unless profits improve, conversion to jets will be held up. Some orders have been postponed already. It's equally clear that the major airlines must convert—people in the industry say no airline can ignore jets and hope to stay in business. If profits are kept at starvation levels, the airlines may soon start down the path the railroads have traveled. Up to now the story of airlines sounds much like the history of the railroads. First, subsidies and encouragement from the government; then restrictive regulation and falling profits. Whether the parallel will continue beyond this point seems to be up to the CAB.

Power Companies Next in Line?

Up to now, the electric power industry has remained healthy despite the fact that average return has run about 6%. Rapid growth and improved generating efficiency have kept the value of equity high and the price of electricity low. Debt capital generally has been cheap. Only recently has inflation become a matter of concern; only recently have interest rates risen; only recently have technological efficiencies been unable to make up the difference.

The future may not be so rosy, according to the study. The report sums it up like this: "In many ways, the power industry today is like the railroads at the turn of the century: (1) It is favored as an investment. (2) Its growth seems assured. (3) Its earnings are restricted to something like the cost of capital. (4) It relies heavily on debt.

"Everybody knows what happened to the railroads in later years. The bubble burst. Restricted by government policy, they were not strong enough to succeed against their competition. The real question in the power industry is not the effect of minor differences among companies in profits since the war. The real question lies in whether the industry can obtain the profits necessary to grow, innovate and serve in the coming atomic age."

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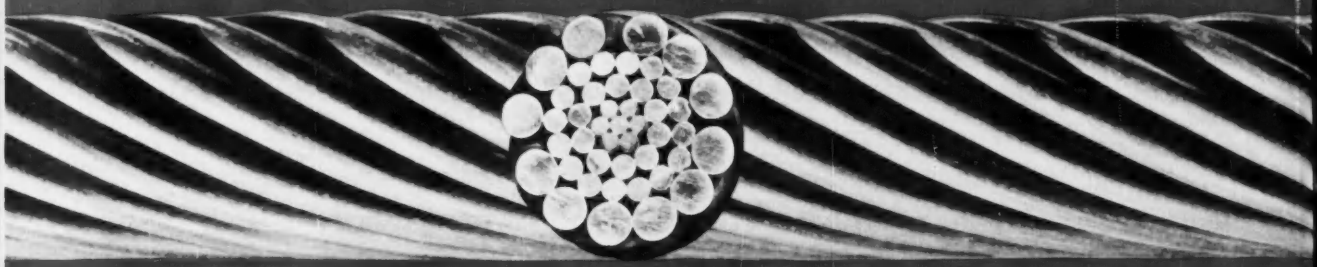

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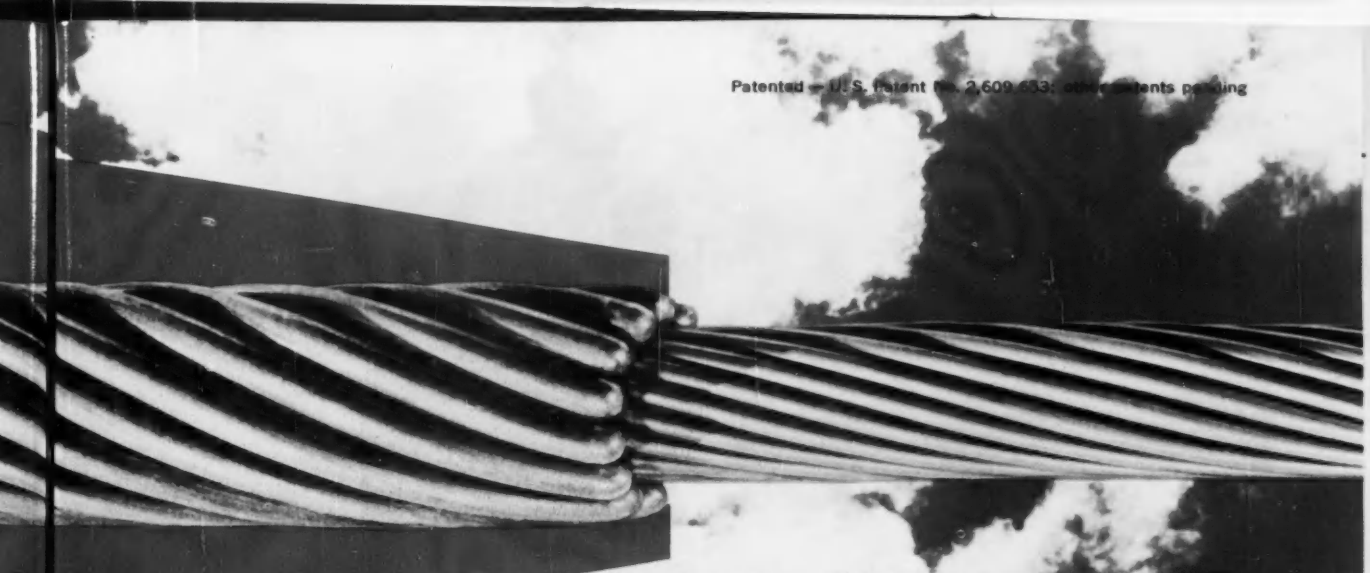

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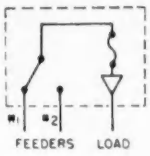

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IES Views Latest Lighting Developments

San Francisco meeting hears papers ranging from integrated lighting-air conditioning schemes to continuous roadway lighting. Need for fluorescent dimming techniques discussed

Some of the latest developments in the lighting field of interest to sales-minded utilitymen were presented at the recent Illuminating Engineering Society meeting in San Francisco. Here are some of the highlights of that meeting.

The possibility of combining lighting and air conditioning in commercial and industrial buildings, with the prospect of heating too, is coming closer, according to W. S. Fisher and J. E. Flynn of General Electric. But higher lighting levels are causing a heat problem, they said. In office buildings where about 100 foot-candles of general illumination is provided, the lighting load ccounts for about 37% of the total air conditioning requirements. If the load is increased to provide 400 ft-c, the lighting then accounts for more than 70% of the cooling capacity.

They went on to say that since all lighting generates heat as well as light, ways need to be found to control heat and capitalize on its thermal properties. This can be done through integrated lighting-air conditioning systems.

Fisher and Flynn demonstrated a troffer which carried heat away from high ft-c lighting before it could enter the space being lighted and cooled. In winter, the troffer could direct the lamp heat into the working area to supplement or replace the heating system, they said.

Cost Is Important Factor

One of the most important factors in street lighting today is cost, both initial and operating, according to M. E. Robertson, Jefferson Electric Co, Bellwood, Ill.

He told the group that lower cost series mercury installations are practical as a result of heavier constant current regulator loadings, made possible through new insulating transformer designs.

Series circuits are advantageous in that long runs can be made with small wire sizes, simplified control can be used, maintenance costs are lower and close regulation of lamp watts is automatic, he said. However, since series circuits also have very high voltages, the series loop must be maintained or all lamps go out and a relatively high cost constant current regulator is required, Robertson noted.

The assumption that highways between centers of population will someday be lighted, was the starting point in a study conducted by Charles H. Rex and J. S. Franklin of GE's outdoor lighting department in Hendersonville, N. C. They described preliminary research into numerical evaluation of roadway lighting in terms of driver comfort and seeing effectiveness.

Various testing methods, from the use of a test roadway with lighting installations to special environmental chambers were described. Rex and Franklin feel that their data will lay additional groundwork for an eventual attack on the highly complex problem of highway lighting between cities.

Lower Light Levels in Tunnels?

An argument for lower lighting levels in tunnels was made by Harold Skootsky and John R. Brass, California Division of Highways, who maintained that a result of installing long lines of fluorescent luminaires has been too high lighting levels in many vehicular tunnels. "The additional operating cost of higher than necessary light levels cannot be justified," they stated.

The primary problem is the inflexibility of the fluorescent tube as far as dimming is concerned. Skootsky and Brass concluded that the ultimate development in tunnel lighting will be practical luminous walls and ceilings.

They said that it is imperative to maintain a higher lighting levels in

EUROPEAN LIGHTING problems were covered by Ludovic Gaynard of Paris, left, while Dr H. R. Blackwell, right, discussed results of highway lighting tests

daytime, when the drivers' eyes are unaccustomed to darkness, than at night when a lower level will suffice.

The quartz lighting lamp may well revolutionize certain phases of lighting practice, according to Carl J. Allen and Ronald L. Paugh of GE's large lamp department. It offers unusual physical and functional features which permit the design of reflectors and luminaires never before practicable with a general purpose light source, they say.

The characteristics of this new filament lamp are: High wattage in small volume bulbs; good luminous efficacy with practically no reduction in light output throughout life; efficient operation on high-volt as well as on standard 120-v circuits; and increased life without the accompanying reduction in filament temperature and efficacy.

When the cost advantages of the lamp's high mean luminous efficacy is combined with the definite savings of the higher voltage lighting circuits and the possible savings of potentially lighter-weight, higher efficiency luminaires, the quartz lighting lamp becomes a potential contender for many lighting applications, they said.

Fluorescent Dimming Needed

Philip E. Massie and Allen B. Rosenstein, Day-Ray Products, S. Pasadena, Calif. and UCLA, described the advantages which would accrue from development techniques for wide-range dimming of fluorescent lamps. This would combine the advantages of fluorescent lamps, such as coolness and efficiency, with the flexibility to meet changing lighting demands. Development of such techniques would permit the use of fluorescents in movie theatres, aircraft and restaurants, and would lead to economies in industrial applications, they said.

Better street lighting could cut down the number of accidents in the United States, according to a scientific study completed by Dr. H. Richard Blackwell, director of Vision Research Institute of Ohio State University.

Over an eight-months period Dr. Blackwell and his staff studied 2 and 3 lane highways in Ohio and North Carolina to determine how much lighting was needed for pedestrian and vehicular safety. They chose roadways that were considered well lighted with clean equipment. Mannequins of a little black dog and an 11-year-old girl were placed at a distance of 200 feet from a car traveling at 45mph. It was found that in order to see these objects in time to stop, more light was needed in the curb lane than in the driving or inside lane. At 200 feet, 2.2 foot candles of illumination are needed for the curb lane and 1.3 foot candles are needed for the driving lane.

In lighting the road, the lamps should be placed between 100 and 125 yards apart and should be maintained in service at all times, the study showed.

It was found there are three times as many accidents at night as during the day, and that the seriousness of accidents is affected by the amount of lighting.

The present standard amount of lighting ranges between .6 foot candle to 1 foot candle. The Illuminating Engineering Society is convinced night driving can be made as safe as daytime driving, provided there is adequate lighting maintained-in-service at all times, according to C. L. Crouch, Technical Director of IES. It costs between ½ and 1% of total highway construction costs to light a highway, Crouch said.

European Lighting Shown

Society members were taken on a delightful color slide tour of French and Western Europe and public lighting projects by L. Gaymard, street lighting chief engineer, Electricite' de France. Gaymard's slides showed how European lighting engineers have solved tricky illumination problems from the Champs to Lake Como.

A primary problem in Europe is the esthetic wish to preserve old lamp housings. To replace a Napoleonic gas lamp with a modern electric light without disturbing the Napoleonic atmosphere is typical of the problems facing European engineers.

One of the most difficult jobs he ever handled was lighting the Champs, which has slow-moving pedestrian traffic in the outer lanes and speeding autos in the center lanes. In this problem the need to preserve old-world charm clashed head-on with modern, practical necessity for high-intensity roadway lighting. Audience was shown how a dual lighting system solved the problem.

SELLING BRIEFS

Night light which plugs directly into any wall or baseboard receptacle (no wires, fixtures or switches needed) has been introduced by Sylvania Electric Products Inc. Designed as a home safety aid, the "Panelescent" Nite Lite, produces light over the entire metal panel surface for five years at less than three cents a year.

Fluorescent lighting, while more expensive to maintain than mercury-vapor lamps, is more "dramatic," produces "more uniform light," and can bring New York "more business," claims the Manhattan borough president's office.

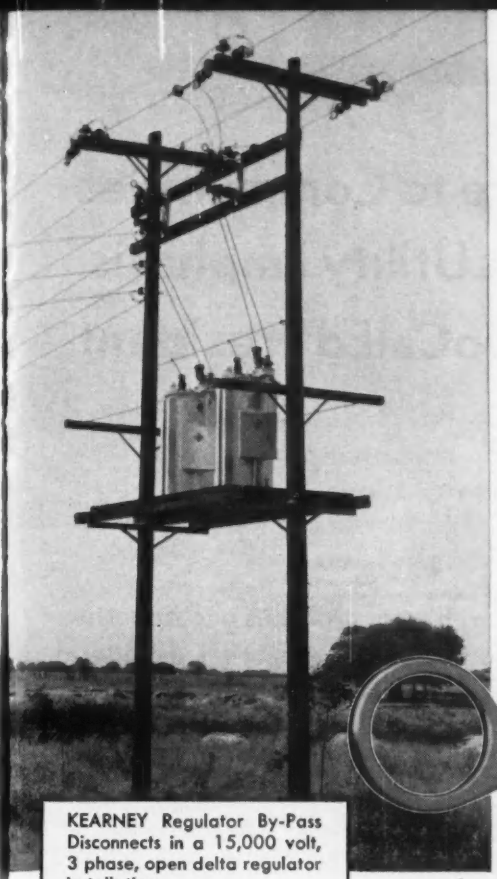
By the year 2,000, 85% of U. S. population will live in urban areas, according to a new study by the Urban Land Institute cited by "Housing Trends." New super-areas will include: "Chesapeake and Potomac City" including Baltimore and Washington, D. C.; "Delaware Valley City" centered on Philadelphia; "South East Florida City" with Miami as its hub; "North East City" around Boston.

"High-Low" bulbs designed to give 17 to 22% more light and give improved reliability in floor and table lamps equipped with 3-way sockets developed by General Electric.

Air-cooled hydrogen lamp (type HAK-50) has been developed by Sylvania Lighting Products, division of Sylvania Electric Products Inc, for use in Hydrogen Arc Illuminator produced by Bausch & Lomb Optical Co. Chief advantage over water-cooled systems is elimination of water supply and tube breakage.

Safe performance

of 4 operations in proper sequence assured by KEARNEY *REGULATOR BY-PASS* DISCONNECT



KEARNEY Regulator By-Pass Disconnects in a 15,000 volt, 3 phase, open delta regulator installation.

- **no danger of accidentally dropping load**
- **no hazard from interrupting exciting current**

With the same motion—in the same time—required to open *one* conventional disconnect, the KEARNEY Regulator By-Pass Disconnect:

shunts the line leads to by-pass the regulator—opens both leads to the series winding—safely interrupts the exciting current.

What's more, you realize substantial savings in cost of switches, installation time, supporting structure and leads, because *only one* KEARNEY By-Pass Disconnect is needed for each phase of a regulator installation, compared to *three* single-throw disconnects. And the operator has *maximum safety*, since all switches can be located on the same side . . . visible from one point!

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The Mark of Quality PRODUCTS

Plants at: ST. LOUIS • FAYETTEVILLE, ARK. • SHENANDOAH & CLARINDA, IOWA—GUELPH, ONT., CANADA

Service to Communities Merits Utility Emphasis, Says SoCalEd President

Familiarity with local problems and opportunities should find power executives shouldering important role, J. K. Horton believes

Youngish, community-minded J. K. "Jack" Horton is beginning to get a firm grip on the reins as president of Southern California Edison Co. Still new to California's southland, Horton, 43, joined SoCal early this year after serving as president of Canada's Alberta & Southern Gas Company Ltd., since 1957.

Horton is no stranger to California, however, having lived in the San Francisco Bay area for 20 years since college days at Stanford University in the mid-thirties. While at Stanford, Horton was eager for a career in law, and upon graduation, in 1936, enrolled in evening classes at the Oakland College of Law. Four busy years later, Horton was admitted to the Bar, and practiced in the San Francisco area before joining Standard Oil of California in 1943 as a legal specialist in oil and gas leases.

Oil Work Leads to Utility Career

It was Horton's association with Standard that started him on his career in the utility field. Standard at the time was controlling stockholder in Pacific Public Service, and its top administrative officials served in a similar capacity for PPS. In 1944, Standard began developing an independent management group for the utility, offered young Horton the post of secretary and legal counsel for the five-member holding company.

Since then, Horton's rise has been meteoric. Rapidly succeeding to posts of increasing responsibility with PPS, Horton within eight years became executive vice president and then president of Pacific Public Service and its operating companies.

According to Horton, his legal background has proved helpful, especially during the early part of his career.

Diverse Background Helps

"Pacific Public was a small company, but as with all utilities, its legal problems cut a swath across all operating divisions. I had opportunity to work on a variety of problems including labor law, tax work, public utility proceedings, financial matters—a whole host of problems. This coupled with the fact that all management people wore several administrative hats at PPS, made it an excellent training ground for a newcomer to the utility field."

In 1954, when Pacific's principal operating company—Coast Counties Gas & Electric Co—merged with Pacific Gas & Electric Co, Horton was elected a vice president of PG&E. Then in 1957, in his final assignment with PG&E, Horton was elected president of Alberta & Southern, a Canadian subsidiary of PG&E.

When asked about the outlook for western utilites, generally, Horton was bullish: "The booming population growth in the 11 western states should make the Sixties a real growth decade for western utilities".

Horton is outspoken on the role that utility executives should shoulder in community affairs.

"Utility people by reason of their close contact with their communities are familiar with local problems and opportunities," says Horton, "and can render responsible and knowledgeable service to their communities."

Backs Up His Beliefs

His role in community affairs backs up his beliefs. During the past few years he's played a prominent part in local Community Chest and United Fund campaigns. In addition, he has served as a director of Junior Achievement, the organization that encourages and assists young people to become successful entrepreneurs. Horton is also a member of the American Bar Association, the Los Angeles Chamber of Commerce and a director of the Pacific Coast Electrical Assn.

When away from the job Horton likes to relax by shooting an "almost respectable" game of golf and whipping up outdoor barbecues for wife Betty and their three children. Horton, incidentially, credits much of his barbecuing success to a fairly new electrical charcoal starter.

I wish we had more time and personnel to prepare for this rate case!

Your staff is overloaded now. Call in the specialists and let them carry the peak load. HOW ABOUT PIONEER?

GIVE YOUR NON-ROUTINE OPERATIONS TO PIONEER

Design and Consulting Engineering Services

Pioneer has specialized in designing power plants for 57 years. It designs fossil fuel, hydro and atomic plants. It forecasts load growth, selects sites, purchases and expedites equipment and supervises construction. Pioneer's other services include substation, transmission and distribution studies and design.

Services in Regulatory Matters

Pioneer offers services in all phases of Federal, State and Local regulation including rate base, depreciation analysis, cost of service studies, market analysis, certificate proceedings and rate of return.

Corporate Services

Pioneer's services in corporate matters include business and management engineering advice, financial, accounting, tax counsel, insurance, and pension planning. It maintains a complete stock transfer, ledger and dividend disbursement service.

NEW!

On your letterhead, write for 40-page booklet, "Pioneering New Horizons in Power". Describes, illustrates Pioneer's engineering services, and corporate services, from financing to operation.

57 YEARS

Pioneer Service & Engineering Co.

231 South La Salle Street
Chicago 4, Illinois

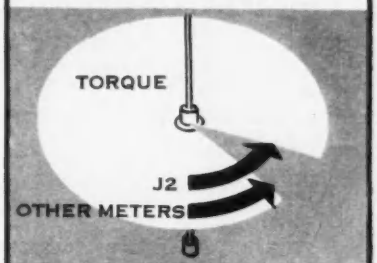
METERMAN'S CHECK LIST

Get Sustained Accuracy Even as System Capacity Grows

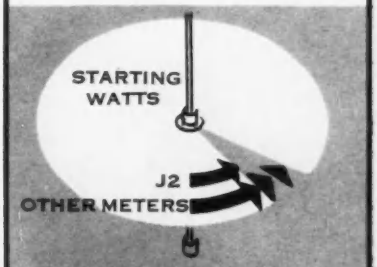
Sangamo J2 Watthour Meters provide the long-life accuracy that is so essential as test intervals lengthen and residential loads increase. Uniform load curves from 1.5 through full 200 amperes prove the J2's sustained, "straight line" accuracy on both light and heavy loads.

The J2, with its slow speed, exceptionally high torque, and ability to begin measuring on fewer starting watts than other meters, provides unexcelled extended range metering for all services, present and potential.

SANGAMO ELECTRIC COMPANY
SPRINGFIELD, ILLINOIS



UP TO 15% MORE TORQUE



UP TO 25% LESS STARTING WATTS

O'Connor, Talbott Named Montana Power VPs

George W. O'Connor and William W. Talbott have been elected vice presidents of the Montana Power Co. They succeed C. J. Burns, who retired Oct. 31 as senior vice president, in addition to continuing their presently assigned responsibilities.

O'Connor will continue working in customer and community relations. He will take over Burns' conduction of labor negotiations, direction of the utility's state-wide safety plan, and special executive assignments.

Continuing as general sales manager, Talbott will assume Burns' duties directing commercial, residential, and industrial sales and indutrial development, personnel and policy matters concerning employee welfare in the fields of workmen's compensation, group life insurance, and as executive for special assignments.

O'Connor joined the utility as executive assistant in 1957 after a career as gas pipelines constructor, merchant and rancher. A Republican, he served as speaker of the House in 1943 and 1945.

Joining Montana Power in 1931, Talbott came to the Butte office last July as executive assistant and became the utility's general sales manager Oct. 1.

O'CONNOR

TALBOTT

EEI Makes Parkerson Statistics Chief

Edison Electric Institute has appointed William Parkerson supervisor of statistics in the Department of Economics and Statistics.

A Tulane University graduate engineer, Parkerson began his utility statistics and rate matters career with Louisiana Electric Co (now Gulf States Utilities Co). He later served with Public Service Co of Oklahoma, Central Power & Light Co, Middle West Service Co and Ebasco International Corp.

Prior to joining EEI, Parkerson carried out assignments in Brazil and Chile as Asst Manager of the Ebasco International Rate Department. He is a member of the American Statistical Assn and the American Society of Mechanical Engineers.

Snow Becomes Cambridge Electric Supt

Cambridge Electric Light Co has named John G. Snow general superintendent of all electric transmission and distribution operations and general supervisor of the Transportation and Stores Departments.

A 1923 electrical engineering graduate of Worcester Polytechnic Institute, Snow worked in the Cape & Vineyard Electric Co until 1929 when he was transferred to Cambridge Electric Light Co as assistant head of the Construction and Repair Department. He has been electrical superintendent since his appointment to that position in 1951.

(*More News About People on p* 134)

LET'S TALK ABOUT STRAND...

Aluminized STRAND

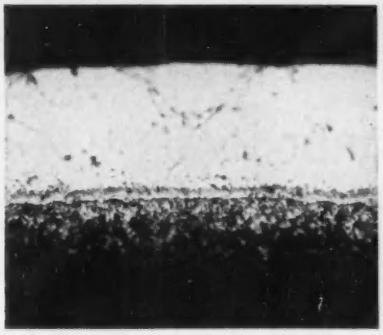
ACCO *Aluminized* steel strand is composed of steel wires which have an adherent, ductile aluminum coating applied by the hot dip method. The result—strand with all the strength of steel, and with the corrosion-resistance of aluminum. Also, you get these important advantages:

Aluminum oxide protection—Aluminum, when exposed to the atmosphere, has a film of aluminum oxide formed over it. This film, though thin, is impervious to corrosive atmospheres, provides extra protection in the most severe service.

Electrochemical protection—Should nicks or cuts pierce the aluminum coating, the corrosion-resistance will be retained by an electrochemical "healing" process.

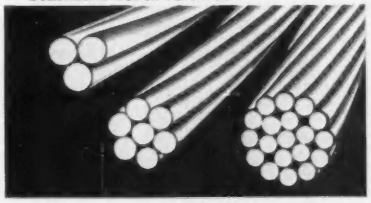
Salt spray tests, conducted according to ASTM procedures, show that with equal thicknesses of coating, *aluminized outlasts galvanized by more than 2 to 1.* Available for guy wire, ground wire and messenger wire applications, Page ACCO Aluminized steel strand is offered in Common, Siemens-Martin, High Strength, Extra High Strength and Utility grades with physical properties conforming to ASTM Spec. A-122-54T and A-363-58.

Page also makes galvanized and stainless steel strand.



500X magnification above shows thin aluminum-iron alloy resulting from diffusion of the two metals, and the outer layer of aluminum in the form of a fine-grain cast structure.

5-year test exposure to industrial atmospheres covered strand with coating of sulfide, oxide and soot. Scrubbing with soap and water showed aluminum coating completely unaffected.



Page ACCO Aluminized steel strand is available with 3, 7 and 19-wire construction.

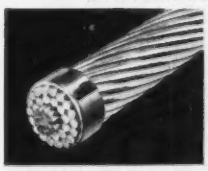
WRITE FOR DETAILS. Booklet DH-537 explains manufacture, properties and uses of Page ACCO Aluminized Steel Strand. Write us at Monessen, Pa., for your copy.

PAGE MANUFACTURERS WIRE

ACCO

Page Steel and Wire Division
American Chain & Cable Company, Inc.
Monessen, Pa., Atlanta, Chicago, Denver, Detroit, Houston, Los Angeles, New York, Philadelphia, Portland, Ore. San Francisco, Bridgeport, Conn.

OTHER ACCO ALUMINIZED STEEL WIRES



Aluminized ACSR core wire now available from leading manufacturers of aluminized conductor cable.

Page Chain Link Fence of ACCO Aluminized wire provides economical, longer-lasting protection.

Tie wire, telephone and telegraph wire, lashing wire, barbed wire, and other products are also available in Page ACCO Aluminized wire.
Ask us for details.

PAGE *-the source for answers to wire problems*

METERMAN'S CHECK LIST

Get Consistent Overload Accuracy and Reduced Wear

Sangamo J2 Watthour Meters are the only meters that match slower disk speed with increased overload capacity. The result: more uniform load curves, and reduced wear on all moving parts, fewer repairs and replacements, longer meter life, more economy.

64,000 fewer revolutions per day

In one day, the disk of a conventional Class 100 meter operating at full capacity makes 160,000 revolutions. The J2 makes 64,000 fewer. Actually, the J2 makes only 10 revolutions per minute at full name-plate rating. That's a full 40% slower than any other meter.

SANGAMO Electric Company
SPRINGFIELD, ILLINOIS

PERRINE

MITCHELL

BRACKMAN

Perrine Becomes NARUC Head; Mitchell, Brackman VPs

George R. Perrine has been named president of the National Assn of Railroad & Utilities Commissioners. Peter E. Mitchell and David M. Brackman have become first and second vice president, respectively.

Perrine is chairman of the Illinois Commerce Commission. Mitchell is commissioner of the California Public Utilities Commission, and Brackman is commissioner of the Massachusetts Department of Public Utilities.

A member of the Illinois Commerce Commission and the NARUC Executive Committee since 1953, Perrine is also chairman of the special committee cooperating with Federal Communications Commission in studies of telephone regulatory problems and is a member of the committee on nuclear energy in the electric industry.

Mitchell is chairman of the NARUC Executive Committee and a member of the special committee studying telephone regulatory problems with the FCC.

Brackman is a member of the Committee on Rates of Public Utilities and is chairman of the special committee on legislation amending the Federal Power Act.

SoCalEd Sub Names Althouse Leader

A. W. Althouse has become president of the Associated Southern Investment Co (formerly Edison Securities Co), a Southern California Edison Co subsidiary.

A former manager of SoCalEd's right of way & land department, Althouse has been associated with the company since he joined in 1919 as a bookkeeper. He subsequently served as chief clerk in the utility's Delano, Lindsay, Visalia, and Pasadena districts. He has also been Alhambra district manager, assistant commercial manager in the company's general offices, and metropolitan division manager.

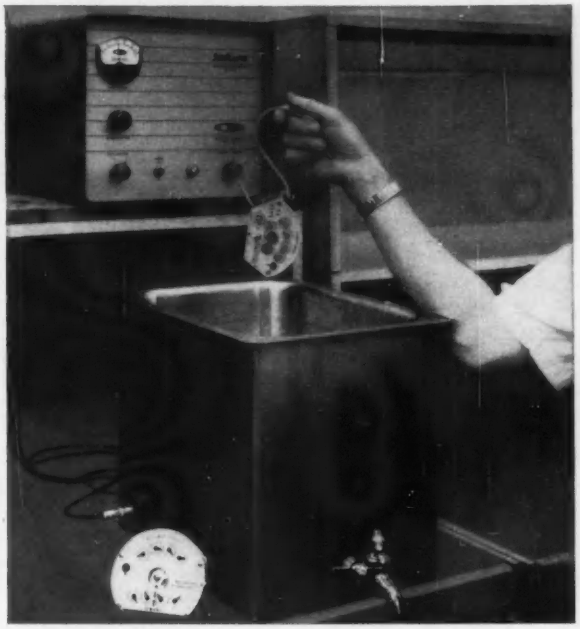
KAMO Co-op Gives Williams Top Post

James W. Williams has been elected president of the KAMO Electric Cooperative at Vinita, Okla. He succeeds the late Lloyd Evans.

Williams has long been associated with the rural electric program. He is currently serving as secretary-treasurer of the Board of Directors of Central Rural Electric Cooperative.

He was one of the board members who signed the original incorporation papers in 1941 that formed KAMO Electric Cooperative. KAMO is now a $21 million business made up of rural electric cooperatives in Kansas, Arkansas, Missouri, and Oklahoma.

(*More News About People on p* 136)



now! **CUT** *meter and instrument maintenance* **COSTS** *with a...*

Narda *SONBLASTER*®

Ultrasonic Cleaner!

300-Watt G-1501 Generator, 5-gallon NT-1505 Tank
Other models from $175; 2-year guarantee on all units

$695

- Users report almost 90% savings!
- Clean complete assembly at one time!
- Eliminate labor & mechanical brushing!
- No special skills or training needed!

Cleaning meters and other instruments the old-fashioned way is tedious and expensive—can add up to labor costs as high as $9 or $10 per register—unless you use a Narda SonBlaster! Then, it's more like $1 per unit, and this figure comes from an actual user.

Some more examples: One company cleaned 16 units in 36 minutes, including preparation. Another reports that switching to Narda to clean cumulative demand registers as assembled units saves $11,000 annually, per 10,000 units processed.

How's it done? Merely fill the tank with solvent, flip the switch, and submerge your complete assembly. In minutes... seconds...every shaft, gear, bearing and part is meticulously clean!

Narda will be glad to show *you* how to start saving *immediately* on cleaning meters, timing devices, and instruments in general. Write us, outlining your problem. Address: Dept. EW-8.

More SonBlasters sold than all other ultrasonic cleaners combined!

the narda ultrasonics corporation

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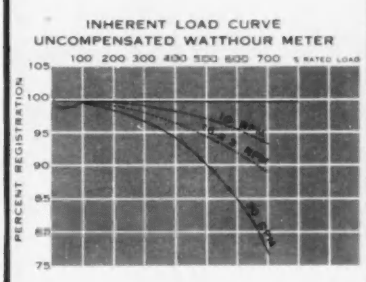
Subsidiary of The Narda Microwave Corporation

METERMAN'S CHECK LIST

Greater Overload Capacity With Less Compensation

The Sangamo J2 Watthour Meter needs less compensation for "straight-line" accuracy. Its individual overload curves are more uniform, too.

These built-in "plusses" come from the J2's slow, 10 revolutions-per-minute disk speed. Check this: current damping, which varies directly with the current flux squared and the disk speed, causes the phenomena of reduced registration on higher loads. With a slow speed J2, current damping plays a smaller role in overload accuracy.

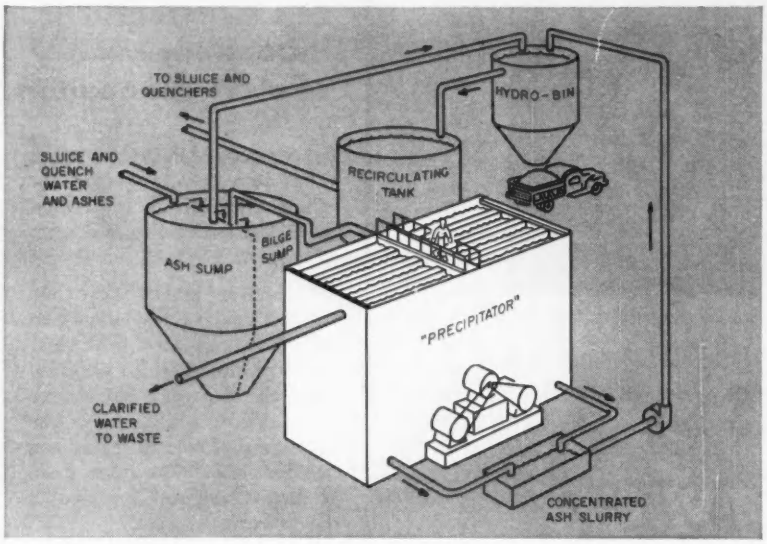


As can be seen from the curves on the graph, the inherent load curve of an uncompensated 10 rpm meter is substantially better than meters with higher speeds. The slow speed of the J2 also reduces wear on moving parts.

SANGAMO Electric Company
SPRINGFIELD, ILLINOIS

FLUIDICS

is a Pfaudler Permutit program providing
the know-how
the equipment
and the experience
for solving problems involving fluids



FLUIDICS AT WORK

Precipitator separates 15 to 25 tons of ashes per day for U.S. Rubber Co.

. . . makes ash-handling system flexible, dependable.

Ash problems at U. S. Rubber's Detroit plant are typical. The powerhouse has widely varying loads . . . requiring a flexible ash-handling system. The system must also be dependable, because all clarified effluent water goes into the Detroit River and this water must not contain suspended solids that could obstruct the river channel.

Tests were run at U. S. Rubber's plant using a pilot-scale Permutit Precipitator. As a result of these tests, a 300 gpm horizontal unit was installed. (See simplified flow chart.)

U. S. Rubber's Permutit Precipitator goes a long way to make their system successful. In use over 2 years, the Precipitator handles varying loads of 15 to 25 tons of suspended ash per day . . . at low cost without coagulants or other chemicals . . . yet it always delivers effluent water as clean as the river water itself.

on experience with all basic types of solids separation processes—coagulation, settling, flotation, centrifuging, evaporation and ion exchange. Write to our Permutit Division, Industrial Waste Treatment Dept. EW-119, 50 West 44th St., New York 36, N.Y.

FLUIDICS covers such varied phases of fluid handling and control as:

water treatment	metering
waste treatment	valving
corrosioneering	flow rate control
fluid analysis	piping
agitation	storing
blending	heat transfer

Whenever you have a fluid-handling problem put the Pfaudler Permutit FLUIDICS program to work.

PFAUDLER PERMUTIT INC.

Specialists in FLUIDICS . . .
the science of fluid processes

Cornell-Dubilier Appoints Leary Sales Manager

The recent decision to boost the size of its sales organization created a new post at Cornell-Dubilier Electric Corp that Raymond T. Leary has been picked to fill. He was named general sales manager with responsibilities for the firm's field sales activities, including Radiart and Tobe products.

A 1942 Brown University graduate, Leary moves up from his position as vice president and sales manager of the distributor division. He joined Cornell-Dubilier, which manufactures capacitors, vibrators and other electronic products, in 1946.

PERSONAL BRIEFS

Saskatchewan Power Corp has appointed **H. C. Mollard** to northern system supervisor.

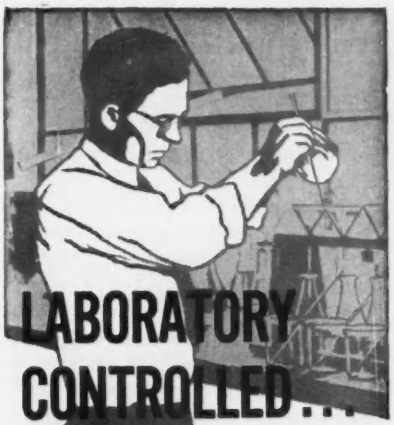
Potomac Edison Co names **Robert W. Bowen** personnel assistant.

Newman C. Stirewalt has retired as vice president and purchasing and stores agent for the Central Illinois Public Service Co.

Norman A. Cocke, retired president of Duke Power Co, has been named "Man of the South for 1959" by the magazine *Dixie Business,* edited and published by Hubert F. Lee.

Central Illinois Public Service Co appointed the following: **H. Mason Parker** to superintendent of Carbondale group operations and **Orlie J. Rue, Jr,** to industrial engineer of the Southern Division staff.

Paul E. Davis, Jr, who has served



LABORATORY CONTROLLED...

Crapo

GALVANIZED STEEL STRAND FOR GUY, MESSENGER and OVERHEAD GROUND WIRE

The high, uniform, consistently-dependable quality of Crapo Galvanized Steel Strand is the direct result of close laboratory control over each step in manufacture. All wires used in forming a particular size and grade are produced from steel of selected analysis, carefully processed under technical supervision and stranded on precision machines. Both wire and finished strand are subjected to prescribed laboratory tests to insure the desired end result.

Heavy, uniform, tightly-bonded zinc coatings, applied by the famous Crapo Galvanizing Process, provide maximum resistance to corrosion.

Write for booklet OG-25 containing "Sag and Tension Data for Overhead Ground Wire."

INDIANA

STEEL & WIRE CO., INC., Muncie, Indiana

as division line engineer since 1948, has been promoted to general line engineer and will move to Carolina Power & Light Co's general office in Raleigh. Succeeding Davis in the division engineer post is **Earl F. Stephenson** who has been attached to the Florence office since 1954.

H. P. Forman, formerly assistant to the president, appointed director of public relations of Puget Sound Power & Light Co.

Arkansas-Missouri Power Co promoted **Joe T. Hughes** from personnel director to executive assistant.

Ralph E. Secord appointed as Central Division superintendent of the New England Electric System, succeeding **Stanley W. Stoddard** retired. **Kenneth L. Taylor** named superintendent of electrical construction of the New England Power Service Co. Frank A. Sterni has been made assistant.

Duke Power Co has made these recent appointments: **F. Yates Drum** to system safety director, succeeding **Dwight B. Moore** who has been promoted to assistant to the manager of Duke's Charlotte district office; **Harry M. Turbyfill,** formerly an acting line foreman in the Charlotte district to safety supervisor of the South Central Safety Division, and **Rush W. Hood** to electric superintendent of the company's Anderson district.

Recent retirements . . . **Joseph M. Sullivan,** assistant manager of employee relations, Detroit Edison Co . . . **Dee J. McGonigle,** general sales manager, Montana Power Co . . . **C. H. Gunn,** senior field engineer; **W. P. Spier,** supervisor of communications, and **C. C. Warren,** assistant system operator, Georgia Power Co.

Neil R. Damon has been named supervisory electrical engineer at Parker Dam, Calif. for the Bureau of Reclamation.

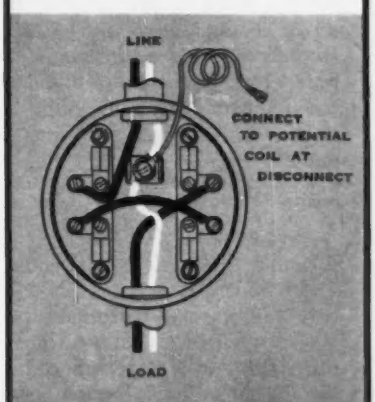
Resources for the Future named **Joseph L. Fisher** president and executive director, succeeding Reuben G. Gustavson retired.

(*More News About People, p* 138)

METERMAN'S CHECK LIST

Protect Today's Investment in 2-Wire Services

Sangamo J2 Watthour Meters are designed so that standard 3-wire meters can be installed on 2-wire service by simple socket connections.



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Thin Profits Plague A-Industry

Atomic Industrial Forum told that achievement of commercial industry is held back through lack of government support

A restive young atomic industry, chaffing under twin restraints of low profits and government domination of nuclear technology, voiced its dissatisfaction in unmistakable terms at the Atomic Industrial Forum conference in Washington, early this month.

Spokesmen for the industry complained that up to now commercial atomic power development has been conducted on a relative shoestring. As a result, achievement of a true commercial atomic industry is being pushed back many years through lack of government economic support. Moreover, they said, the atomic industry now finds itself in direct competition with material laboratories for government support. This is a serious matter for the industry, involving both economic philosophy and material policy.

Industry Shares Blame

Dr Chauncey Starr of the Atomics International Division of North American Aviation, in a keynote address, said that many industrial organizations are turning to other fields of endeavor because of insufficient profit in the low income atomic business.

Starr partly blamed the industry itself for its contraction. "It occurs to me that the term 'profit-motivated' is one that we rarely hear in connection with our industry. It is avoided as if it were criminal or unclean to be interested in profit," Starr said.

He charged specifically that the government, after stimulating industrial participation and investment to develop atomic technology, hasn't lived up to its end of the bargain. "Our national objectives have shrunk," he said.

Government spokesmen, on the other hand, pledged continued government support to the industry for the development of dependable and competitive nuclear power reactors which would be acceptable to utilities. The AEC, they said, would select and support reactor concepts it considered best, and conversely would weed out concepts which did not offer equal promise.

AEC chairman John A. McCone, just back from a tour of Soviet atomic installations and laboratories, said he was impressed by the speed with which the Soviets appear able to reach a specific objective once they decide that it is of overriding importance to them. If the U. S. is to continue its atomic leadership, McCone said, we must find ways to match their ability to concentrate scientific and technical efforts on important undertakings—even at the expense of projects of lesser importance.

"Our ultimate goal remains unchanged," McCone said. "It is to develop nuclear power technology to a point where it is accepted as dependable and competitive and, therefore, useful to both public and private utilities."

AEC is now engaged in a detailed study of the many power reactor concepts in its program. Attempts are being made to forecast the prospect of their success in reaching our ultimate goal, the time required, and the effort and cost involved, McCone reported.

Discusses Competition

Details of this analysis were made public for the first time at the AIF conference by Dr Frank Pittman, director of AEC's Reactor Development Div. In his summary Pittman said:

- No reactor system can be constructed on the basis of *today's* technology which can compete with power from conventional systems using fuel costing less than 54¢ per million Btu.

He assumed a conventional plant of 300 Mw and a load factor of 70%.

- Six of the present reactor systems *can* become competitive with conventional plants using fuel costing in the range of 35 to 40¢ per million Btu.
- Of these six systems which could complete in the range of 35-40¢ per million Btu, the pressurized water systems could so *at the earliest date.*
- The potential of the water systems, with nuclear superheat, and the organic system is essentially equal from the standpoint of power cost, time when the potential can be achieved, and development costs needed to reach the goal. Other systems will require one to four years longer, and take two to three times as much development effort.

Outlines Progress

Pittman estimated power cost from a 300-Mw pressurized-water plant, built with today's technology at 9.28 mills per kwhr—lower, he said, than any other type reactor. But AEC studies show that total cost of power from a "potential plant" ten years hence might be 7.81 mills per kwhr. To achieve this gain a research and development effort of $20 million would be required.

By making use of existing plants, or those now building, it would not be necessary to build more experimental or prototype reactors, Pittman said. Construction of the "potential plant" could be started concurrently with the research and development program soon.

A dual-cycle boiling water system in a comparable 300-Mw plant, built on the basis of today's technology, could produce power at 9.61 mills per kwhr Pittman said. He estimated total cost of power from a future "potential plant" of this type as 7.48 mills per kwhr. But a development program of about $20 million would be necessary in the next five years. It would also be necessary to construct and operate a high-power density prototype which would require an additional $25 million, he estimated. Construction of the 300 Mw "potential plant" could start late in 1964 or early 1965.

Pittman saw little possibility of a nuclear superheat reactor being built on the basis of today's technology although it offers a fair potential for reducing the cost of power from water reactors. AEC studies indicate that cost of electricity from a 300-Mw water plant can be re-

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duced 0.74 mills per kwhr through integral nuclear superheat. Applied to the "potential" boiling system, a power cost of 6.75 mills per kwhr results. But to achieve it a development program of $4 million must be carried out between now and 1965, and a nuclear superheat prototype reactor built and operated during that period at a cost of $20 million.

Pittman quoted AEC studies as showing that organic-cooled and moderated systems, built on today's technology, could produce power from a 300-Mw plant for 11.45 mills per kwhr. To reduce the total power cost of a "potential plant" to 7.10 mills per kwhr, it would be necessary, he said, to undertake a research and development program amounting to $40 million, in the next five years. In addition, $30 million additional is needed for construction and initial operation of a 75-Mw prototype reactor.

Robert McKinney, New Mexico publisher, recently-appointed to review the international policies and programs of the U. S. for the Congressional Joint Committee on Atomic Energy, in another principal address, said today's pessimism over the future of atomic energy may well be as much the product of misunderstanding as yesterday's over optimism.

Speaking of recent proposals submitted to Euratom's invitation to European firms to build large nuclear power plants, characterized by the press as disappointing, McKinney said the results weren't as disappointing to those who understood and know what the situation was there. He said it was only good sense to review our atomic experience to date—to see whether the peaceful uses of atomic energy in truth do have real value for human welfare in general and as an instrument of international relations in particular.

In describing the scope of the 1960 audit of atomic energy, McKinney said his study would investigate costs of reactor construction and operation, both at home and abroad; changes in the supply of and demand for fossil fuels and fissionable materials; replies of European utilities to the Euratom invitation; prospects for an effective safeguard system; public concern

(*Continued on page* 141)

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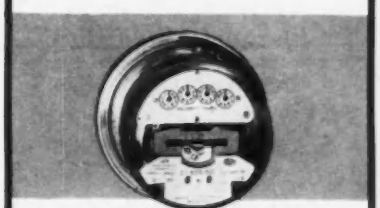

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Thin Profits Plague A-Industry (*Continued from page* 139)

with disposal of radioactive waste; and prospects for disarmament and cooperation with the Soviet Union.

That "hope springs eternal" was never more obvious than in the words of M. Etienne Hirsch, president, European Atomic Energy Community (Euratom), present at the combined annual conference of the Atomic Industrial Forum and the American Nuclear Society, in Washington.

Despite authoritative statements by high-level government and atomic industry leaders, that Euratom's long-range power reactor program was in serious trouble, Hirsh appeared confident as he assured a special press conference of these points:

- Euratom would achieve its goal of one million installed nuclear power capacity by 1963-65.
- There would be no change in Euratom's approach to constructing large-scale nuclear power plants, criticized lately as leaving development of atomic power at the mercy of European utilities.
- European firms were as a whole interested in participating in the Euratom program but for their benefit more flexibility would be injected into the proposed timetable.

Only one acceptable proposal for reactor construction, Italy's 150-Mw boiling water project had been received by Euratom to its invitation before the Oct 20 deadline.

Other atomic leaders at the conference, in separate statements, cast doubt on Euratom's prospects. Euratom's woes were attributed to lack of profit in the atomic energy business for manufacturers and the unwillingness of coldly-realistic European utility managers to invest in expensive reactor complexes.

Books

Designing Transmission

Transmission Line Manual — Mechanical Design. By Rural Electrification Administration, U. S. Dept. of Agriculture. Sold by Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. 148 pages, illustrated, paper bound. Price $1.00.

Intended as a basic guide to the design of transmission lines subject to REA approval, this publication is a good roundup of information pertinent to all overhead construction. It ties together such facets as structural strengths, conductor strengths and sags, clearances, rights-of-way limitations, and coordinates all with the National Electrical Safety Code. This publication should prove useful to all line designers but particularly to engineers who only occasionally work in the transmission and subtransmission field.

Practical Construction Handbook

Field Inspection of Building Construction. By Thomas H. McHaig. Published by Dodge Books Div of F. W. Dodge Corp, 119 W 40th St, New York 18, N. Y. 337 pages, illustrated. Price $9.35.

This practical guide in the inspection of building construction should be valuable to any utility engineer or superintendent who has occasion to make inspections of work in progress. It is not a textbook and is not concerned with theoretical problems.

Presentation of material closely follows sequence of work as it is normally found in building jobs. Comprehensive chapters on concrete and on foundations should prove especially valuable.

Sun, Rain and Snow

Weather and Climate. By Clarence E. Koeppe and George C. De Long. Published by McGraw-Hill Book Co, 330 W 42nd St, New York 36, N. Y. 341 pages, illustrated. Price $7.50.

This comprehensive but introductory study of the weather requires only a layman's knowledge of mathematical and physical principles. Consequently, a layman can readily grasp many important weather concepts which are clearly and simply presented.

Although the book was written primarily for geographers, many common problems and new developments will interest the general reader; particularly the information on jet streams and the movements of air masses. The effect of climate on geography is fully discussed.

METERMAN'S CHECK LIST

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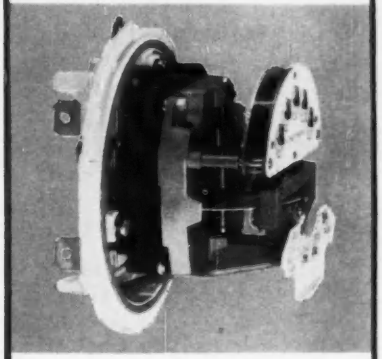

The corrosion resistant finishes used on the J2 are the finest available, anywhere. But, they do change (for the better) because the search for ideal finishes is never-ending. Meters are tested under actual operating conditions in corrosive atmospheres even as Sangamo chemists develop new finishes. As a result of these tests and continuing chemical research, the corrosive resistant characteristics of the J2 meter are being improved constantly.

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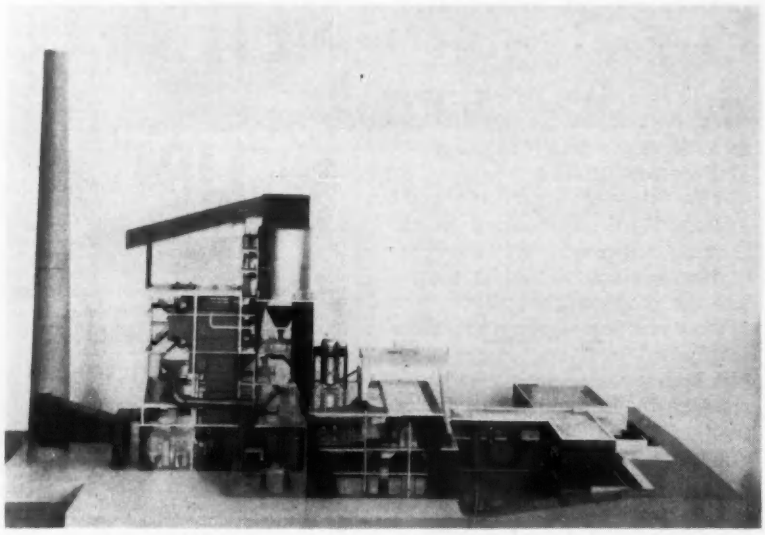

'Spruce Green' Color Picked for Plant

Black Hills Power & Light Co, anxious to make a positive addition to the South Dakota landscape, has decided to use a "spruce green" color for the exterior of its Ben French Station. The designer, engineer and constructor—Stearns-Roger Mfg Co—has picked "Alumalure" finished aluminum sheet made by Aluminum Co of America for the exterior of general plant buildings, turbine house, boiler-lagging, breeching, conveyor cover, and coal bunker building. In building walls, the Alumalure sheet forms the outer surface of a sandwich wall of aluminum and insulation with natural finish aluminum sheet interior. Located in Rapid City, the plant will produce 22,500 kw when completed late in 1960. A Babcock & Wilcox Co Cyclone generator will supply steam at 850 psi and 900F to a 22,000-kw Allis-Chalmers Mfg Co turbine generator. Power will be generated at 13.8 kv, three-phase, 60-cycle, and will be fed to Black Hills' lines at 69 kv.

Utility Seeks Ruling On Estate Heirs Mix-up

Problems stemming from an illegitimate child has caused Baltimore Gas & Electric Co to seek help from Maryland's Court of Appeals. When the company purchased right-of-way on 118 acres of land in 1924, it dealt with a woman who was believed to be sole owner of the property. The land had been left to her and an unmarried sister who died in 1861.

BG&E learned that the unmarried woman had a child when the child's heirs filed a suit protesting the R/W legality. The company suggested a partitioning of the estate between the heirs of the illegitimate child and the woman with whom BG&E contracted, with the R/W remaining, of course, on the latter's property.

This was denied by a Baltimore County Circuit Court so the power company 12 days ago turned to Court of Appeals to prevent the protesting heirs from taking "unfair advantage" of BG&E.

BG&E attorneys said the division of property would give to both parties "their respective fair shares of the property" while preventing the heirs of the illegitimate offspring "from taking an unfair and inequitable advantage of their own protracted silence and acquiescence" since the 1924 date of transmission line construction.

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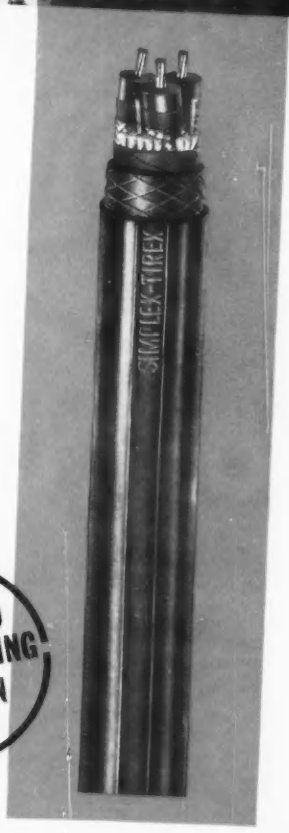

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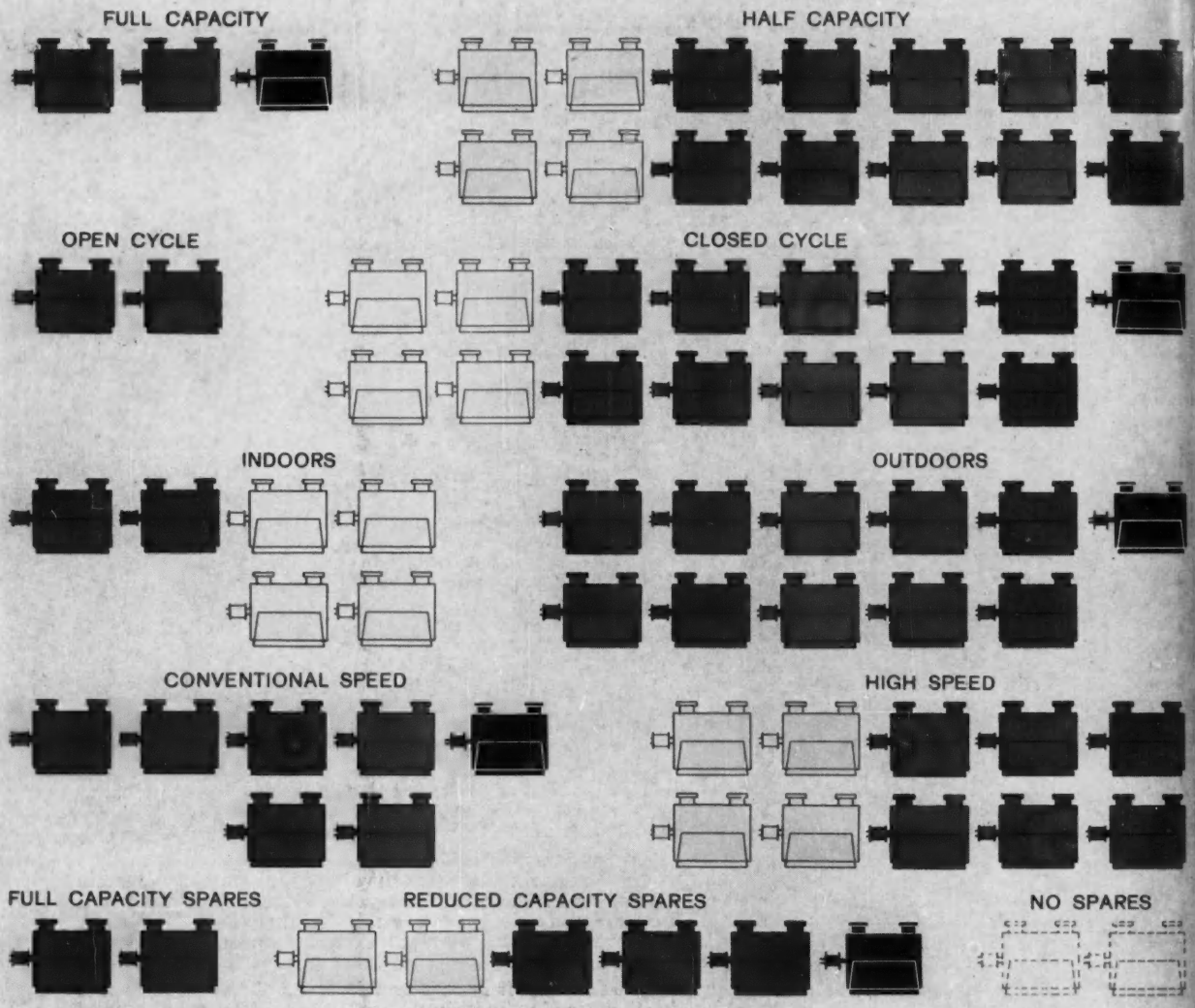

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MAIN DRIVE FEED PUMPS

Driving boiler feed pumps from the main generator shaft is a promising way of cutting power station costs. And Worthington feed pumps are being used to prove out this new idea.

Seventeen Worthington boiler feed pumps, main generator driven, are installed or will soon be installed. These 17 pumps plus their 8 spares will help to generate a total of 2,792,000 kilowatts in 10 separate installations.

Some of the characteristics of each of these pumps are shown. As you can see, there is a wide variety of applications. Some are indoor, some outdoor. Some for open cycle, some for closed. Some operate at conventional speeds of 3500 rpm, some at higher speeds. Some are half capacity pumps, others are full capacity. Some operate with full capacity spares, some with reduced capacity spares, others with no spares.

There is a good reason why most main generator driven pumps bear the Worthington nameplate. Whenever progress must be made, whenever the electric utility industry must forge ahead, more and more companies call on Worthington first . . . for pumps, condensers, deaerators and ejectors. Why don't you do the same?

For a copy of "Economics of Main Turbine Drives," write to Worthington Corporation, Section 45-11, Harrison, New Jersey. Ask for RP-931.

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